



Cisco 10000 Series Router SIP and SPA Hardware Installation Guide

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About This Guide

This preface describes the objectives and organization of this document and explains how to find additional information on related products and services. This preface contains the following sections:

- [Objectives, page vii](#)
- [Audience, page vii](#)
- [Document Revision History, page viii](#)
- [Organization, page viii](#)
- [Related Documentation, page viii](#)
- [Obtaining Documentation, Obtaining Support, and Security Guidelines, page ix](#)

Objectives

This document describes the SPA interface processor (SIP) and shared port adapters (SPAs) that are supported on the Cisco 10000 series router. This document also describes how to install the supported SIP and SPAs and how to troubleshoot the installation.

Audience

This document is intended for network administrators who are familiar with Cisco routers, and who will be installing and configuring SPA interface processors (SIP) and shared port adapters (SPAs) supported on the Cisco 10000 series router.

Document Revision History

Table 1 records technical changes to this document.

Table 1 *Document Revision History*

Cisco IOS Release	Revision	Date	Change Summary
12.2(33)SB	OL-13838-01	April 2008	First release.
12.2(33)SB2	OL-13838-03	September 2008	Introduced the following new hardware on the Cisco 10000 series router for the PRE4. 8-port Gigabit Ethernet Shared Port Adapter (SPA).

Organization

This document contains the following sections:

Chapter	Title	Description
1	SIP and SPA Product Overview	Provides an introduction to the SPA interface processor (SIP) and shared port adapters (SPAs).
2	Cisco 10000 Series Router SPA Interface Processor-600	Provides a SIP and SPA compatibility summary. For each supported SIP, provides a summary of SIP characteristics.
3	Cisco 10000 Series Router Shared Port Adapters	Provides a summary of SPA characteristics for each supported SPA.
4	Preparing to Install a SIP or a SPA	Describes the required tools, equipment, and safety guidelines for installing SIPs and SPAs.
5	Installing and Removing a SIP	Describes the procedures for installing and removing a SIP on a Cisco 10000 series router.
6	Installing and Removing a SPA	Describes the procedures for installing and removing a SPA on a Cisco 10000 series router. It also describes how to verify the SIP and SPA installation.
7	Troubleshooting the Installation	Provides information for troubleshooting the installation of SIPs and SPAs. It also lists helpful debug commands and error messages.

Related Documentation

The related information listed below is available online.

- *Cisco 10000 Series Router SIP and SPA Software Configuration Guide*
- Cisco IOS software:

- For Cisco IOS configuration information and support, refer to the configuration guide or command reference for a Cisco IOS mainline release. You can also refer to the specific Cisco IOS software document for a particular feature.
- To see if a feature is supported by a Cisco IOS release, to locate the software document for that feature, or to check the minimum Cisco IOS software requirements with the hardware installed on your router, Cisco maintains the Software Advisor tool on Cisco.com. You must be a registered user on Cisco.com to access this tool. To access Software Advisor, click **Login** at Cisco.com, type **Software Advisor** in the Search box, and click **Go**. Click the link for the Software Advisor tool.

**Note**

You can access Cisco IOS software configuration and hardware installation and maintenance documentation on the World Wide Web at <http://www.cisco.com>. Translated documentation is available at: http://www.cisco.com/public/countries_languages.shtml.

For international agency compliance, safety, and statutory information for WAN interfaces:

- *Regulatory Compliance and Safety Information for the Cisco 10000 Series Routers*

Obtaining Documentation, Obtaining Support, and Security Guidelines

For information on obtaining documentation, obtaining support, providing documentation feedback, security guidelines, and also recommended aliases and general Cisco documents, see the monthly *What's New* in Cisco Product Documentation, which also lists all new and revised Cisco technical documentation, at:

<http://www.cisco.com/en/US/docs/general/whatsnew/whatsnew.html>



CHAPTER 1

SIP and SPA Product Overview

This chapter provides an introduction to SPA interface processors (SIPs) and shared port adapters (SPAs). It includes the following sections:

- [Introduction to SIPs and SPAs, page 1-1](#)
- [SIP and SPA Compatibility, page 1-2](#)
- [Modular Optics Compatibility, page 1-3](#)
- [Power Management, page 1-4](#)

For software configuration information for the SIPs and SPAs that are supported on the Cisco 10000 series router, refer to the *Cisco 10000 Series Router SIP and SPA Software Configuration Guide*.

Introduction to SIPs and SPAs

SIP and SPA carrier card and port adapter architecture increases modularity, flexibility, and density across Cisco Systems routers for network connectivity. This section describes the SIPs and SPAs and provides some guidelines for their use.

SPA Interface Processors

This section describes general characteristics of a SPA interface processor (SIP). A SIP:

- Is a carrier card that inserts into a router slot like a line card. It provides no network connectivity on its own.
- Contains one or more subslots, which are used to house one or more SPAs. The SPA provides interface ports for network connectivity.
- During normal operation, should reside in the router fully populated with either: functional SPAs in all subslots, or with a blank filler plate (SPA-BLANK=) inserted in all empty subslots.
- Support online insertion and removal (OIR). They can be inserted or removed independently from the SIP.

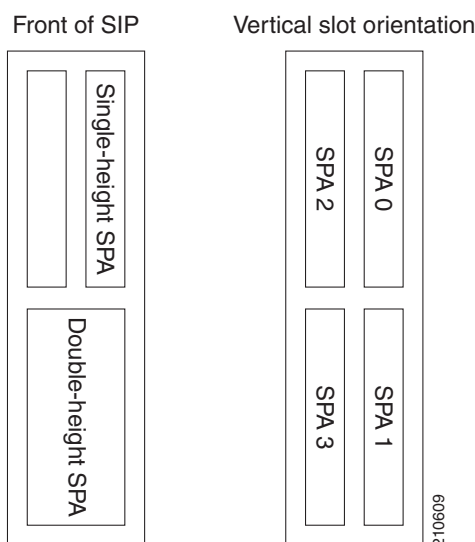
Shared Port Adapters

General characteristics of a SPA include:

- A SPA is a modular type of port adapter that inserts into a subslot of a compatible SIP carrier card to provide network connectivity and increased interface port density. A SIP can hold one or more SPAs, depending on the SIP type and the SPA size.
- SPAs are available in the following sizes:
 - Half-height—Inserts into one SIP subslot.
 - Full-height—Inserts into two horizontally aligned SIP subslots. The Cisco 10000 SIP-600 supports two full-height SPAs, specified as SPA 0 and SPA 1.
 - Full-height, double-wide—Occupies four standard, half-height SIP subslots.

Figure 1-1 shows the slot orientation for the SPAs.

Figure 1-1 Vertical Chassis Slot Orientation for SPA Subslots



- Each SPA provides a certain number of connectors, or ports, that are the interfaces to one or more networks. These interfaces can be individually configured using the Cisco IOS command-line interface (CLI).
- To maintain cooling integrity, either a blank filler plate (SPA-BLANK=) or a functional SPA must reside in each subslot of a SIP during normal operation. Blank filler plates are available in half-height form only.
- SPAs support online insertion and removal (OIR). They can be inserted or removed independently from the SIP. The SIP also supports OIR with SPAs inserted in their subslots.

SIP and SPA Compatibility

Table 1-1 shows the SPAs that are supported on the Cisco 10000 series router and the SIPs that support them.

Table 1-1 SIP and SPA Compatibility

SPA	Product ID	SIP-600	Minimum Cisco IOS Software Release
1-port 10-Gigabit Ethernet SPA	SPA-1X10GE-L-V2	Yes	12.2(33)SB
2-port Gigabit Ethernet SPA	SPA-2X1GE-V2	Yes	12.2(33)SB
5-port Gigabit Ethernet SPA	SPA-5X1GE-V2	Yes	12.2(33)SB
8-port Gigabit Ethernet SPA	SPA-8X1GE-V2	Yes	12.2(33)SB2

Modular Optics Compatibility

Some SPAs implement small form-factor pluggable (SFP or XFP) optical transceivers to provide network connectivity. The SFP and XFP modules are fiber-optic transceiver devices that mount to the front panel to provide network connectivity.


Note

SFP modules are optics modules with speeds lower than 10 gigabits per second (Gb/s); XFP modules are optics modules with speeds equal to or greater than 10 Gb/s.

Cisco Systems qualifies the SFP modules that can be used with SPAs.


Note

The SPAs accept only the optics modules listed as supported in this document. Each time an SFP or XFP module is inserted into a SPA, a check is run. Only SFP and XFP modules that pass this check are usable.

[Table 1-2](#) shows the types of optics modules that are qualified for use with a SPA.

Table 1-2 SPA Optics Compatibility

SPA	Qualified Optics Modules—Cisco Part Numbers
1-port 10-Gigabit Ethernet SPA	- XFP-10GLR-OC192SR - XFP-10GER-OC192IR
2-port Gigabit Ethernet SPA	- SFP-GE-T¹ - SFP-GE-S - SFP-GE-L - SFP-GE-Z

Table 1-2 SPA Optics Compatibility (continued)

SPA	Qualified Optics Modules—Cisco Part Numbers
5-port Gigabit Ethernet SPA	• SFP-GE-T • SFP-GE-S • SFP-GE-L • SFP-GE-Z
8-port Gigabit Ethernet SPA	• SFP-GE-T • SFP-GE-S • SFP-GE-L • SFP-GE-Z

1. A single-port, 1000BASE-T, Small Form-factor Pluggable copper transceiver

Power Management

SPAs and SIPs consume chassis power; therefore, make sure the chassis is within the power budget on the Cisco 10000 series router. [Table 1-3](#) shows the maximum power consumption, in watts, for the SIP and SPAs.

Table 1-3 SIP and SPA Power Consumption

SIP	Maximum Power Consumption (Watts)
10000 SIP-600	160 ¹
SPA	
1-port 10-Gigabit Ethernet SPA	25
2-port Gigabit Ethernet SPA	12.9
5-port Gigabit Ethernet SPA	18.1
8-port Gigabit Ethernet SPA	20 (with SX and LX optics) 22.3 (with ZX optics)

1. Maximum with four SPAs installed



Note

There are no power consumption restrictions on the types of SPAs inserted in a Cisco 10000 SIP-600, or on the number of SIPs installed in a chassis (up to the maximum of 4 SIPs).



CHAPTER 2

Cisco 10000 Series Router SPA Interface Processor-600

This chapter describes the SPA interface processor (SIP) 600 which is supported on the Cisco 10000 series router. This chapter contains the following sections:

- [SIP Summary, page 2-1](#)
- [Identifying Slots and Subslots for SIPs and SPAs](#)
- [Cisco 10000 SIP-600 Overview, page 2-6](#)

SIP Summary

[Table 2-1](#) describes the SIP that is supported on the Cisco 10000 series router.



Note

The Description column indicates the aggregate bandwidth supported by the SIP across all subslots—not for each SPA subslot.

Table 2-1 **SPA Interface Processor Summary**

SIP	Product Number	Description	Maximum Number of SPAs	Minimum Cisco IOS Software
Cisco 10000 SIP-600	10000-SIP-600	1 x 10-Gb/s SPA interface processor	4 half-height SPAs 2 full-height SPAs 1 full-height, double-wide SPA	12.2(33)SB

Checking Hardware and Software Compatibility

You can check the minimum software requirements of Cisco IOS software with the hardware installed on your router. Use the Software Advisor tool on Cisco.com. This tool does not verify if SIPs or SPAs within a system are compatible, but it provides the minimum Cisco IOS requirements for individual hardware modules or components.



Note

Access to the Software Advisor tool is limited to users with Cisco.com login accounts.

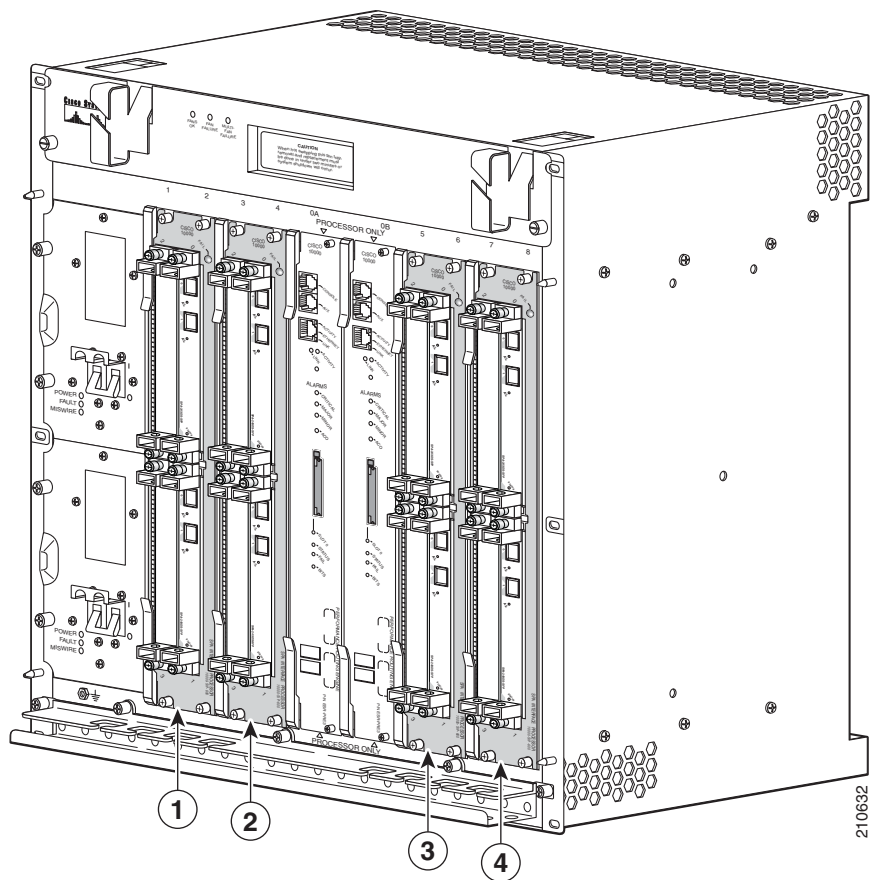
Identifying Slots and Subslots for SIPs and SPAs

This section describes how to specify the physical locations of a SIP and SPA on the Cisco 10000 series router using the command-line interface (CLI) to configure or monitor those devices.

Specifying the Slot Location for a SIP

The Cisco 10000 SIP-600 is a full-height, vertical line card that occupies two physical slots in a Cisco 10000 series router. Each chassis supports a maximum of four SIPs. [Figure 2-1](#) shows the slot numbers for a Cisco 10000 series router fully populated with SIPs.

Figure 2-1 SIPs Installed in a Cisco 10000 Series Router



1	SIP slot 1	3	SIP slot 5
2	SIP slot 3	4	SIP slot 7

Some commands allow you to display information about a SIP and its SPAs, such as **show inventory** and **show diag**. For example, to view information about the SIP installed in chassis slot 1 and its SPAs, enter the following command:

```
Router# show diag 1/0
```

```

Slot/Subslot 1/0:
  4jacket-1 card, 0 ports
  Card is full slot size
  Card is analyzed
  Card detected 07:42:30 ago
  Card uptime 0 days, 7 hours, 42 minutes, 31 seconds
  Card idle time 0 days, 3 hours, 3 minutes, 17 seconds
  Voltage status:
EEPROM contents, slot 1/0:
  Controller Type      : 1380
  Hardware Revision    : 1.0
  PCB Part Number      : 73-10771-01
  Board Revision       :
  Deviation Number     : 0-0
  Fab Version          : 01
  PCB Serial Number    : CSJ10497186
  RMA Test History     : 00
  RMA Number           : 0-0-0-0
  RMA History          : 00
  Top Assy. Part Number : 800-27953-01
  CLEI Code            : UNASSIGNED
  Product Identifier (PID) : 10000-SIP-600
  Version Identifier (VID) : V00
LCMON version, slot 1/0
  LCDOS (C10000 PowerQUICC-III Line Card MONitor Image : DEVELOPMENT BUILD
jkotelly-spumoni_lc /vob/lcdos/obj-c10k-pq3-lcmon 102
)
  Built by jkotelly at Thu Nov  9 10:54:20 2006.
  Reset reason 0x00000008 (PRE hard reset).
Operational Image version, slot 1/0
  LCDOS (C10000 4 SPA Jacket Card Image (Spumoni) : DEVELOPMENT BUILD
BLD-mayflower_lc.lcdos-nightly-mayflower-c10k /vob/lcdos/ob
j-c10k-spumoni 102) major version 1189663592.
  Built by ashah at Thu Sep 13 02:08:59 2007.
  SW Version 4.0
  Code MD5 068FBA5273DC8F598CC66E34D867A197
  FPGA MD5 89C8DD3DCD939BDD43DB19D514416137
  Expected Switchover Action: NO ACTION
  ECC 1 bit errors since last cleared (dd hh mm ss) = 0 (0 days, 0 hours, 0 minutes,
0 seconds)
  ECC 1 bit errors while up (total) = 0
  Number of crashdumps recorded = 8

  SPA Information:
subslot 1/0   SPA-5X1GE-V2           ok

  SW Version 1.0
  Expected Switchover Action: NO ACTION
  Product Identifier (PID) : SPA-5X1GE-V2
  Version Identifier (VID) : V01
  PCB Serial Number       : JAB105201VV
  Top Assy. Part Number    : 68-2616-01
  Top Assy. Revision       : D0
  Hardware Revision        : 1.1
  CLEI Code               : CNUIANAAAA
  The Transceiver in slot 1 subslot 0 port 0 is ENABLED.
  The Transceiver in slot 1 subslot 0 port 1 is ENABLED.
  The Transceiver in slot 1 subslot 0 port 2 is ENABLED.
  The Transceiver in slot 1 subslot 0 port 3 is ENABLED.
  The Transceiver in slot 1 subslot 0 port 4 is ENABLED.

  SPA Information:
subslot 1/1   SPA-5X1GE-V2           ok

```

```

SW Version 1.0
Expected Switchover Action: NO ACTION
Product Identifier (PID) : SPA-5X1GE-V2
Version Identifier (VID) : V01
PCB Serial Number      : JAB110202HP
Top Assy. Part Number   : 68-2616-01
Top Assy. Revision      : E0
Hardware Revision       : 1.1
CLEI Code               : CNUIANAAAA
The Transceiver in slot 1 subslot 1 port 0 is ENABLED.
The Transceiver in slot 1 subslot 1 port 1 is ENABLED.
The Transceiver in slot 1 subslot 1 port 2 is ENABLED.
The Transceiver in slot 1 subslot 1 port 3 is ENABLED.
The Transceiver in slot 1 subslot 1 port 4 is ENABLED.

SPA Information:
subslot 1/2   SPA-5X1GE-V2      ok

SW Version 1.0
Expected Switchover Action: NO ACTION
Product Identifier (PID) : SPA-5X1GE-V2
Version Identifier (VID) : V01
PCB Serial Number      : JAB1042060D
Top Assy. Part Number   : 68-2616-01
Top Assy. Revision      : D0
Hardware Revision       : 1.1
CLEI Code               : CNUIANAAAA
The Transceiver in slot 1 subslot 2 port 0 is ENABLED.
The Transceiver in slot 1 subslot 2 port 1 is ENABLED.
The Transceiver in slot 1 subslot 2 port 2 is ENABLED.
The Transceiver in slot 1 subslot 2 port 3 is ENABLED.
The Transceiver in slot 1 subslot 2 port 4 is ENABLED.

SPA Information:
subslot 1/3   SPA-5X1GE-V2      ok

SW Version 1.0
Expected Switchover Action: NO ACTION
Product Identifier (PID) : SPA-5X1GE-V2
Version Identifier (VID) : V01
PCB Serial Number      : JAB110202GA
Top Assy. Part Number   : 68-2616-01
Top Assy. Revision      : E0
Hardware Revision       : 1.1
CLEI Code               : CNUIANAAAA
The Transceiver in slot 1 subslot 3 port 0 is ENABLED.
The Transceiver in slot 1 subslot 3 port 1 is ENABLED.
The Transceiver in slot 1 subslot 3 port 2 is ENABLED.
The Transceiver in slot 1 subslot 3 port 3 is ENABLED.
The Transceiver in slot 1 subslot 3 port 4 is ENABLED.

Router#

```

The following example displays information about the 2-port OC12 SPA:

```

Router#show diag 5/0
Slot/Subslot 5/0:
  4jacket-1 card, 0 ports
  Card is full slot size
  Card is analyzed
  Card detected 01:25:03 ago
  Card uptime 0 days, 1 hours, 25 minutes, 3 seconds
  Card idle time 0 days, 0 hours, 1 minutes, 52 seconds
  Voltage status:
EEPROM contents, slot 5/0:

```

```

Controller Type           : 1380
Hardware Revision         : 1.0
PCB Part Number           : 73-10771-01
Board Revision            :
Deviation Number          : 0-0
Fab Version               : 01
PCB Serial Number         : CSJ10497112
RMA Test History          : 00
RMA Number                : 0-0-0-0
RMA History               : 00
Top Assy. Part Number     : 800-27953-01
CLEI Code                 : UNASSIGNED
Product Identifier (PID)   : 10000-SIP-600
Version Identifier (VID)   : V00

LCMON version, slot 5/0
  LCDOS (V122_33_2_31_SBK06-BOOT : DEVELOPMENT BUILD chandrav-lcmon
/vob/lcdos/obj-cl0k-pg3-lcmon 114)
  Built by chandrav at Sun Jun 15 13:55:54 2008.
  Reset reason 0x00000008 (PRE hard reset).

Operational Image version, slot 5/0
  LCDOS (C10000 4 SPA Jacket Card Image (Spumoni) : DEVELOPMENT BUILD
BLD-v122_34_sb_lc_throttle.lcdos-V122_33_3_10_SB-v122_34_sb_throttle
/vob/lcdos/obj-cl0k-spumoni 102) major version 1219740068.
  Built by richv at Tue Aug 26 04:44:51 2008.
  SW Version 1.1
  Code MD5 53E9196510CAE3216B1663318CA47620
  FPGA MD5 89C8DD3DCD939BDD43DB19D514416137
  Expected Switchover Action: NO ACTION
  ECC 1 bit errors since last cleared (dd hh mm ss) = 0 (0 days, 0 hours, 0 minutes,
0 seconds)
  ECC 1 bit errors while up (total) = 0
  Number of crashdumps recorded = 3

SPA Information:
subslot 5/0   SPA-2XCHOC12/DS0      ok

SW Version 1.0
Expected Switchover Action: NO INFORMATION
Product Identifier (PID) : SPA-2XCHOC12/DS0
Version Identifier (VID) : V01
PCB Serial Number       : PRTA6404025
Top Assy. Part Number   : 68-3137-01
Top Assy. Revision      : 02
Hardware Revision        : 0.17
CLEI Code               :
The Transceiver in slot 5 subslot 0 port 0 is ENABLED.
The Transceiver in slot 5 subslot 0 port 1 is ENABLED.

```

For more information about SIP commands, see the *Cisco 10000 Series Router SIP and SPA Software Configuration Guide*.

Specifying the Location for a SPA

A Cisco 10000 SIP-600 supports four subslots for the installation of SPAs. The SPA subslots are numbered from 0 to 3, as shown in [Figure 2-2](#). The number for each SPA subslot is indicated by a small numeric label on the SIP faceplate.

SPAs in the Cisco 10000 series router use an addressing format that specifies the physical location of the SIP, SPA, and interface in the format *slot/subslot/port*, where:

- *slot*—Specifies the chassis slot number where the SIP is installed.
- *subslot*—Specifies the secondary slot of the SIP where the SPA is installed.
- *port*—Specifies the interface number that you want to select on the SPA.

To display information about a SPA, use the **show diag**, **show hw-module subslot**, and **show inventory** commands. For more information about SPA commands, refer to the *Cisco 10000 Series Router SIP and SPA Software Configuration Guide*.

Cisco 10000 SIP-600 Overview

The following sections describe the Cisco 10000 SIP-600:

- [Cisco 10000 SIP-600 Processor, page 2-6](#)
- [Cisco 10000 SIP-600 LED, page 2-6](#)
- [Cisco 10000 SIP-600 Physical Specifications, page 2-8](#)

Cisco 10000 SIP-600 Processor

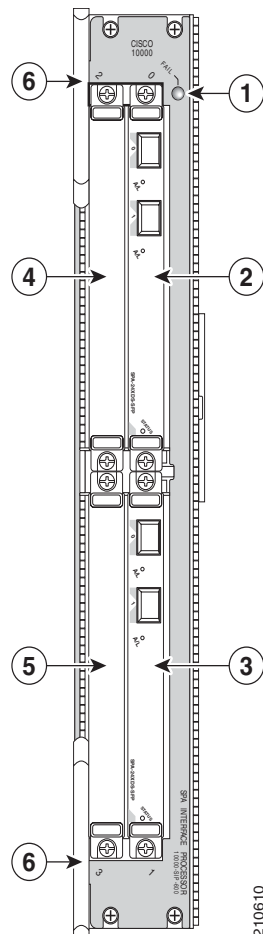
[Table 2-2](#) describes the processor on a Cisco 10000 SIP-600.

Table 2-2 Cisco 10000 SIP-600 Processor

Type	Speed	Description
CPU	800 megahertz (MHz) internal operating frequency	Power QUICC III integrated communications processor

Cisco 10000 SIP-600 LED

The Cisco 10000 SIP-600 has one LED ([Figure 2-2](#)).

Figure 2-2 Cisco 10000 SIP-600 Faceplate

1	Fail LED	4	SPA subslot 2
2	SPA subslot 0	5	SPA subslot 3
3	SPA subslot 1	6	Ejector levers

Table 2-3 describes the LED on the Cisco 10000 SIP-600.

Table 2-3 Cisco 10000 SIP-600 LED

LED Label	Color	State	Meaning
FAIL	Amber	On	The SIP is booting. If the Fail LED remains on for more than 5 seconds or if it turns on during normal operation, the SIP experienced a failure. Refer to Chapter 7, “Troubleshooting the Installation” for SIP and SPA troubleshooting information.
		Off	The SIP is active and operating normally.

Cisco 10000 SIP-600 Physical Specifications

Table 2-4 lists the Cisco 10000 SIP-600 physical specifications.

Table 2-4 Cisco 10000 SIP-600 Physical Specifications

Description	Specifications
Physical dimensions (H x W x D)	16 x 2.44 x 10.4 in. (41.5 x 6.32 x 27 cm) The SIP occupies two physical slots in a chassis.
Weight	10.0 lb (4.6 kg)
Operating temperature	41 to 104°F (5 to 40°C)
Relative humidity	Operating—10 to 90 percent, noncondensing Storage—5 to 95%
Storage temperature	–4 to 149°F (–20 to 65°C)



CHAPTER 3

Cisco 10000 Series Router Shared Port Adapters

This chapter describes the shared port adapters (SPAs) that are supported on the Cisco 10000 series router and contains the following sections:

- [Bandwidth Oversubscription, page 3-1](#)
- [1-Port 10-Gigabit Ethernet SPA Overview, page 3-4](#)
- [2-Port Gigabit Ethernet SPA Overview, page 3-7](#)
- [5-Port Gigabit Ethernet SPA Overview, page 3-11](#)
- [8-Port Gigabit Ethernet SPA Overview, page 3-15](#)

Bandwidth Oversubscription

On a Cisco 10000 series router running a Performance Routing Engine 4 (PRE4), each half of the chassis comprises four slots and is serviced by a single Nickel 10G Application Specific Integrated Circuit (ASIC) that supports a bandwidth of 11.2 Gbps, as represented in [Figure 3-1](#). The total bandwidth supported on either half of chassis is limited to 11.2Gbps regardless of number of linecards, SIPs or SPAs. To maximize throughput, install the SIP or SPA interfaces for ingress and egress, evenly on both sides of the chassis. This is achieved by using any pair(s) of odd slots on opposite sides of the PREs.

When interfaces are oversubscribed, the line cards on a heavily oversubscribed side receive less overall bandwidth as compared to the line cards on the undersubscribed side. It is important to balance the bandwidth between the left and right sides of the chassis when the forwarded throughput is more than 10 Gbps.

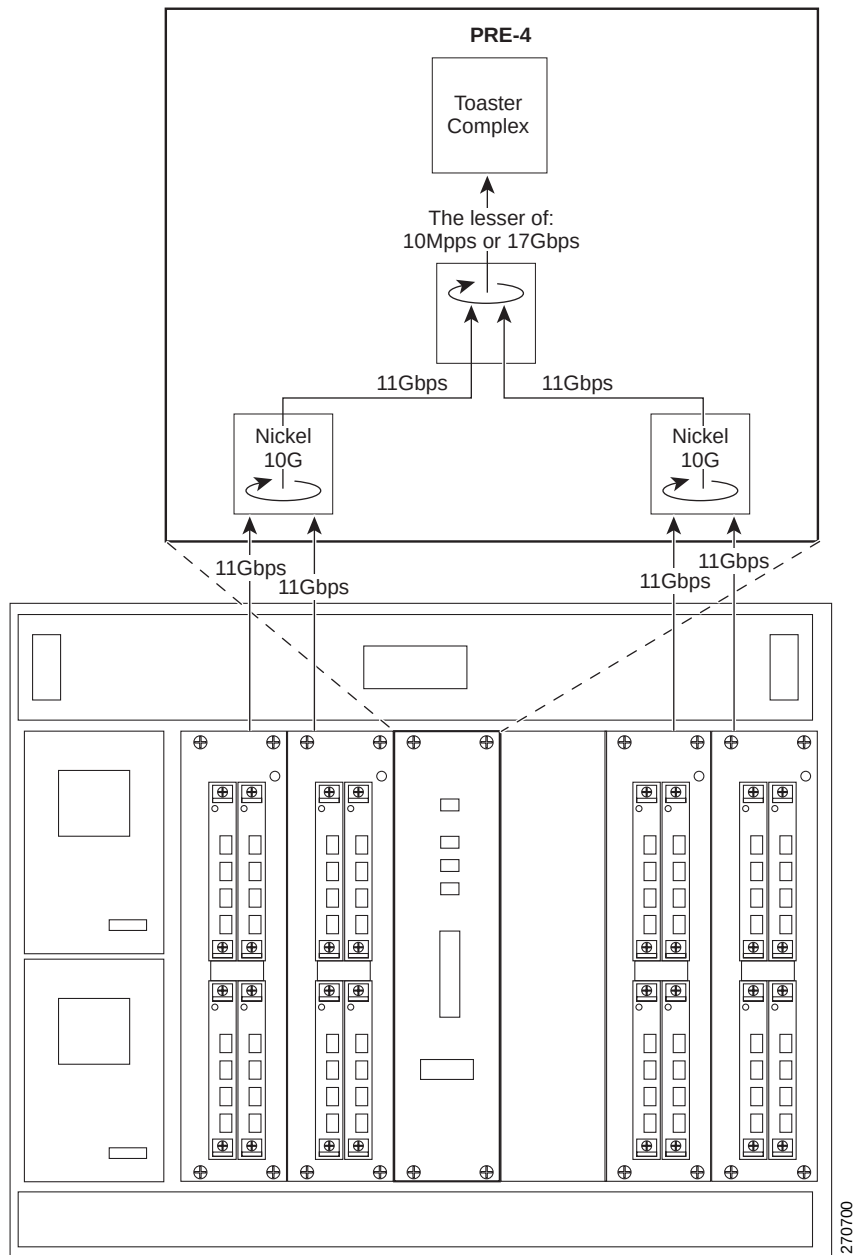
Figure 3-1 Bandwidth Oversubscription

Table 3-1 provides information about the bandwidth for each port (per-port bandwidth) on a SPA, as well as the cumulative bandwidth (total bandwidth) for all ports available on the SPA.

Table 3-1 SPA Bandwidth Capacity

SPA	Per-Port Bandwidth	Number of Ports	Total Bandwidth
1-Port 10-Gigabit Ethernet SPA	10 Gbps	1	10 Gbps
2-Port Gigabit Ethernet SPA	1 Gbps	2	2 Gbps

Table 3-1 SPA Bandwidth Capacity

SPA	Per-Port Bandwidth	Number of Ports	Total Bandwidth
5-Port Gigabit Ethernet SPA	1 Gbps	5	5 Gbps
8-Port Gigabit Ethernet SPA	1 Gbps	8	8 Gbps

SIP Ingress Oversubscription

The Application-Specific Integrated Circuit (ASIC) device for the Cisco 10000 SIP-600 can receive over 40 Gbps of ingress data from the four SPA SPI4.2 interfaces. While the ASIC supports 40 Gbps of ingress memory write bandwidth, the ingress memory read bandwidth on the SIP is the 10 Gbps rate of the SPI4.2 interface to the backplane.

To support this four-to-one oversubscription, the SIP has 128 MB of error correction code (ECC) protected buffering that is divided between the four SPA subslots. The ingress buffering absorbs transient bursts of traffic from the SPAs.

Each Ethernet SPA has a pair of ingress queues (high and low priority) for each physical port. Each pair of queues is configured into the ingress scheduler based on the bandwidth capability of the port. For example, a 10GE interface is allocated 10 times the bandwidth of a single GE interface. The ingress scheduler will round robin amongst each pair of queues attempting to provide the minimum configured bandwidth.

Within each pair of ingress queues, traffic from the high priority queue is serviced before the normal priority queue. Traffic is selected into a high priority ingress queue by means of the **plim qos** commands as described in the *Cisco 10000 Series Router SIP and SPA Software Configuration Guide*.

PRE4 Egress Oversubscription

When operating with a PRE4, each SIP is viewed as one line card. When there is packet oversubscription on the PRE4, multiple egress queues may contain packets waiting to be transmitted to the SIP. For example, a SIP on the left side of the chassis contains a 1-Port 10-Gigabit Ethernet SPA and a 5-Port Gigabit Ethernet SPA. On the right side of the chassis, the same SPAs are in separate SIPs. In this scenario, the combined egress bandwidth on the right side of the chassis may exceed the egress bandwidth on the left side.

In an oversubscribed system, we recommend that you balance the overall traffic bandwidth between the left and right sides of the chassis. For example, balancing subscriber traffic on one side and trunk traffic on the other side.

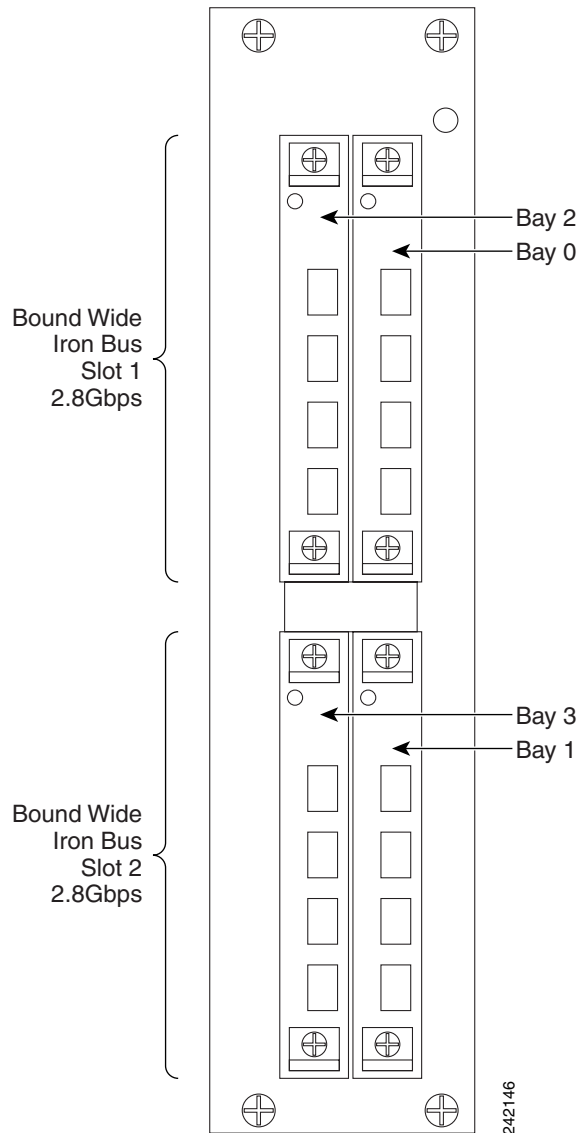


Note

Install the SIPs into the slots that are at the extreme ends of the chassis first.

SIP Performance with a PRE3

When operating with a PRE3, each SIP is viewed as two separate, full-slot line cards, each with a 2.8 Gbps interface, as shown in [Figure 3-2](#). A pair of SPA subslots are assigned to one of the backplane interfaces on the SIP. If one SPA pair does not fully utilize its respective 2.8 Gbps backplane bandwidth, the other SPA pair may not use the excess bandwidth. When using a SIP with a PRE3, we recommend that you balance the overall SPA bandwidth between the top two SPA subslots and the bottom two SPA subslots. Also, install the SIPs in the outside slots of the chassis first.

Figure 3-2 Maximum SIP Bandwidth with PRE3

1-Port 10-Gigabit Ethernet SPA Overview

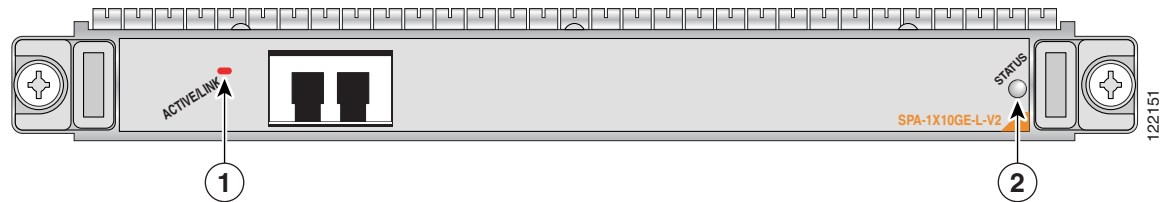
The following sections describe the 1-Port 10-Gigabit Ethernet SPA:

- [1-Port 10-Gigabit Ethernet SPA LEDs, page 3-5](#)
- [1-Port 10-Gigabit Ethernet SPA XFP Optical Transceiver Modules, Connectors, and Cables, page 3-5](#)

1-Port 10-Gigabit Ethernet SPA LEDs

The 1-Port 10-Gigabit Ethernet SPA has two LEDs, an ACTIVE/LINK LED for the port and a STATUS LED, as shown in [Figure 3-3](#).

Figure 3-3 1-Port 10-Gigabit Ethernet SPA Faceplate



1	ACTIVE/LINK LED	2	STATUS LED
---	-----------------	---	------------

[Table 3-2](#) describes the 1-Port 10-Gigabit Ethernet SPA LEDs.

Table 3-2 1-Port 10-Gigabit Ethernet SPA LEDs

LED Label	Color	State	Meaning
ACTIVE/LINK	Off	Off	Port is not enabled by software.
	Green	On	Port is enabled by software and the link is up.
	Amber	On	Port is enabled by software and the link is down.
STATUS	Off	Off	SPA power is off.
	Green	On	SPA is ready and operational.
	Amber	On	SPA power is on and good, and the SPA is being configured.

1-Port 10-Gigabit Ethernet SPA XFP Optical Transceiver Modules, Connectors, and Cables

The 1-Port 10-Gigabit Ethernet SPA supports the following types of optical transceiver modules:

- Single-mode short-reach (SR) XFP module—XFP-10GLR-OC192SR
- Single-mode intermediate-reach (IR) XFP module—XFP-10GER-OC192IR

Cisco Systems qualifies the optics that are approved for use with its SPAs. As of the above-listed small form-factor pluggable (XFPs) are the only optical transceiver modules qualified for use.

Use a single-mode optical fiber that has a modal-field diameter of 8.7 ± 0.5 microns (nominal diameter is approximately 10/125 microns) to connect your router to a network.

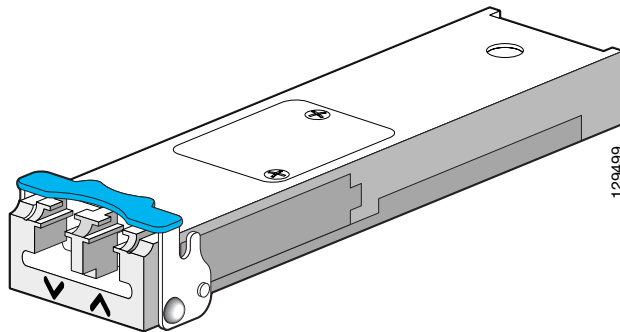
XFP Connections

The XFP-10GLR-OC192SR and XFP-10GER-OC192IR XFP modules include an optical transmitter and receiver pair integrated with Clock and Data Recovery (CDR) integrated circuits. The XFP modules provide high-speed serial links at the rate of 10.3125 Gbps (10 Gigabit Ethernet) on single-mode fiber

(SMF). The transmit side recovers and retimes the 10-Gbps serial data and passes it to a laser driver. The laser driver biases and modulates a 1310-nm or 155-nm laser, enabling data transmission over SMF through an LC connector. The receive side recovers and retimes the 10-Gbps optical data stream from a photo detector transimpedance amplifier and passes it to an output driver.

See the label on the XFP module for technology type and model. [Figure 3-4](#) shows an XFP module and [Table 3-3](#) shows the XFP module specifications.

Figure 3-4 XFP Module



XFP module dimensions are:

- Height: 12.5 mm
- Width: 18.35 mm
- Length: 71.1mm

Table 3-3 XFP Module Specifications for 10-Gigabit Ethernet SPA

Specification	Description
Wavelength (TX)	XFP-10GLR-OC192SR: 1260 nm to 1355 nm XFP-10GER-OC192IR: 1530 nm to 1565 nm
Cabling distance (maximum)	XFP-10GLR-OC192SR: 6.2 miles (10 km) XFP-10GER-OC192IR: 24.8 miles (40 km)
Operating case temperature range	XFP-10GLR-OC192SR: 23 to 158 degrees F (–5 to 70 degrees C) XFP-10GER-OC192IR: 23 to 158 degrees F (–5 to 70 degrees C)
Storage temperature range	XFP-10GLR-OC192SR: –40 to 185 degrees F (–40 to 85 degrees C) XFP-10GER-OC192IR: –40 to 185 degrees F (–40 to 85 degrees C)
TX power	XFP-10GLR-OC192SR: –8.2 to 0.5 dBm XFP-10GER-OC192IR: –4.7 to 4 dBm
Receiver sensitivity (maximum)	XFP-10GLR-OC192SR: –12.6 dBm XFP-10GER-OC192IR: –14.1 dBm

Table 3-3 XFP Module Specifications for 10-Gigabit Ethernet SPA (continued)

Specification	Description
RX overload	XFP-10GLR-OC192SR: 0.5 dBm XFP-10GER-OC192IR: -1.0 dBm
Maximum receiver power damage	XFP-10GLR-OC192SR: +5 dBm XFP-10GER-OC192IR: +5 dBm

XFP Port Cabling Specifications

Table 3-4 shows the port cabling specifications for an XFP module.

Table 3-4 XFP Port Cabling Specifications

XFP Module	Wavelength	Fiber Type
XFP-10GLR-OC192SR	1310 nm	SMF
XFP-10GER-OC192IR	1550 nm	SMF

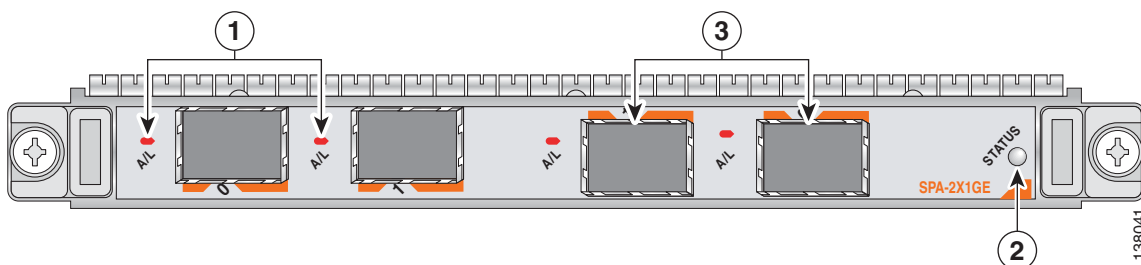
2-Port Gigabit Ethernet SPA Overview

The following sections describe the 2-Port Gigabit Ethernet SPA:

- [2-Port Gigabit Ethernet SPA LEDs](#), page 3-7
- [SFP Module Cabling and Connection Equipment](#), page 3-10

2-Port Gigabit Ethernet SPA LEDs

The 2-Port Gigabit Ethernet SPA has two types of LEDs. There is an A/L LED for each port and one STATUS LED as shown in [Figure 3-5](#).

Figure 3-5 2-Port Gigabit Ethernet SPA Faceplate

1	A/L LED (for each interface)	2	STATUS LED (for entire SPA)
3	Two RJ45 (copper) ports		

The 2-Port Gigabit Ethernet SPA LEDs are described in [Table 3-5](#).

Table 3-5 2-Port Gigabit Ethernet SPA LEDs

LED Label	Color	State	Meaning
A/L	Off	Off	Port is not enabled.
	Green	On	The port is enabled and the link is up.
	Amber	On	The port is enabled and the link is down.
STATUS	Off	Off	SPA power is off.
	Green	On	SPA is ready and operational.
	Amber	On	SPA power is on and good, and SPA is being configured.

2-Port Gigabit Ethernet SPA Cables and Connectors

The interface connectors on the 2-Port Gigabit Ethernet SPA are two individual fiber optic receivers that support two SFP modules. Each port can send and receive traffic using the optical fiber connections. In addition, there are two built-in copper RJ 45 ports provided on the 2-port Gigabit Ethernet SPA as shown in [Figure 3-5](#). A combination of these Gigabit Ethernet ports is permitted, limited to a total of 2 Gigabit Ethernet ports (both copper, both optical, or one copper and one optical).

SFP Module Connections

The small form-factor pluggable (SFP) module is an input/output (I/O) device that plugs into the Gigabit Ethernet optical slots on the 2-Port Gigabit Ethernet SPA, linking the port with a 1000BASE-X fiber-optic network.



Note

The 2-Port Gigabit Ethernet SPA will only accept the SFP modules listed as supported in this document. An SFP check is run every time an SFP module is inserted into the 2-Port Gigabit Ethernet SPA and only SFP modules that pass this check will be usable by the 2-Port Gigabit Ethernet SPA. SFP modules exist for technologies other than Gigabit Ethernet and for products other than the 2-Port Gigabit Ethernet SPA. However, the information in this document pertains only to SFP modules that plug into the 2-Port Gigabit Ethernet SPA ports.

The SFP module has a receiver port (RX) and a transmitter port (TX) that compose one optical interface. [Table 3-6](#) and [Table 3-7](#) provide SFP module information and specifications.

Table 3-6 SFP Module Options

SFP Module Product Number	SFP Module	Description
SFP-GE-S	Short wavelength (1000BASE-SX)	Contains a Class 1 laser of 850 nm for 1000BASE-SX (short wavelength) applications.
SFP-GE-L	Long wavelength/long haul (1000BASE-LX/LH)	Contains a Class 1 laser of 1310 nm for 1000BASE-LX/LH (long wavelength) applications.

Table 3-6 SFP Module Options

SFP Module Product Number	SFP Module	Description
SFP-GE-Z	Extended distance (1000BASE-ZX)	Contains a Class 1 laser of 1550 nm for 1000BASE-ZX (extended wavelength) applications.
SFP-GE-T	RJ-45 copper SFP transceiver (1000BASE-T)	Provides full-duplex Gigabit Ethernet connectivity to high-end workstations and between wiring closets over an existing copper network infrastructure.

Table 3-7 SFP Module Specifications

Specification	Description
Wavelength	SFP-GE-S: 770 to 860 nm SFP-GE-L: 1270 to 1355 nm SFP-GE-Z: 1500 to 1580 nm SFP-GE-T: N/A
Cabling distance (maximum)	SFP-GE-S: 500 m on 50/125um MMF; 300 m on 62.5/125um MMF SFP-GE-L: 6.2 miles (10 km) SFP-GE-Z: 49.7 miles (80 km) SFP-GE-T: 328 ft. (100 m)
Operating case temperature range	SFP-GE-S: 23 to 185 degrees F (–5 to 85 degrees C) SFP-GE-L: 23 to 185 degrees F (–5 to 85 degrees C) SFP-GE-Z: 23 to 185 degrees F (–5 to 85 degrees C)
Storage temperature range	SFP-GE-S: –40 to 185 degrees F (–40 to 85 degrees C) SFP-GE-L: –40 to 185 degrees F (–40 to 85 degrees C) SFP-GE-Z: –40 to 185 degrees F (–40 to 85 degrees C)
Supply voltage range	SFP-GE-S: 3.1 to 3.5 V SFP-GE-L: 3.1 to 3.5 V SFP-GE-Z: 3.1 to 3.5 V

SFP-GE-S Modules

The 1000BASE-SX (short wavelength) module operates on standard multimode fiber-optic link spans of up to 500 m on 50/125um MMF and 300 m on 62.5/125um MMF.

SFP-GE-L Modules

The 1000BASE-LX/LH (long wavelength/long haul) module interfaces fully comply with the IEEE 802.3z 1000BASE-LX standard. However, their higher optical quality allows them to reach 6.2 miles (10 km) over single-mode fiber (SMF) versus the 3.1 miles (5 km) specified in the standard.

SFP-GE-Z Modules

The 1000BASE-ZX (extended wavelength) module operates on ordinary single-mode fiber-optic link spans of up to 49.7 miles (80 km). Link spans of up to 62.1 miles (100 km) are possible using premium single-mode fiber or dispersion-shifted single-mode fiber (premium single-mode fiber has a lower attenuation per unit length than ordinary single-mode fiber; dispersion-shifted single-mode fiber has both lower attenuation and less dispersion).

The 1000BASE-ZX module must be coupled to single-mode fiber-optic cable, which is the type of cable typically used in long-haul telecommunications applications. The 1000BASE-ZX module will not operate correctly when coupled to multimode fiber, and it is not intended to be used in environments where multimode fiber is frequently used (for example, building backbones, or horizontal cabling).

The 1000BASE-ZX module is intended to be used as a Physical Medium Dependent (PMD) component for Gigabit Ethernet interfaces found on various switch and router products. It operates at a signaling rate of 1250 Mbaud, transmitting and receiving 8B/10B encoded data.

When shorter lengths of single-mode fiber are used, it may be necessary to insert an in-line optical attenuator in the link to avoid overloading the receiver.

- Insert a 10-dB in-line optical attenuator between the fiber-optic cable plant and the receiving port on the 1000BASE-ZX module at each end of the link whenever the fiber-optic cable span is less than 15.5 miles (25 km).
- Insert a 5-dB in-line optical attenuator between the fiber-optic cable plant and the receiving port on the 1000BASE-ZX module at each end of the link whenever the fiber-optic cable span is equal to or greater than 15.5 miles (25 km) but less than 31 miles (50 km).

SFP-GE-T Modules

The SFP-GE-T (1000BASE-T copper SFP module) provides full-duplex Gigabit Ethernet connectivity to high-end workstations and between wiring closets over an existing copper network infrastructure. The SFP-GE-T maximum cabling distance is 328 feet (100 m).

SFP Module Cabling and Connection Equipment

Table 3-8 provides cabling specifications for the SFP modules that can be installed on the 2-Port Gigabit Ethernet SPA. Note that all optical SFP ports have LC-type connectors.

The minimum cable distance for the SFP-GE-S is 6.5 feet (2 m), and the minimum link distance for the SFP-GE-Z is 6.2 miles (10 km) with an 8-dB attenuator installed at each end of the link. Without attenuators, the minimum link distance for the SFP-GE-Z is 24.9 miles (40 km).

Table 3-8 SFP Module Port Cabling Specifications

SFP Modules	Wavelength (nm)	Fiber Type	Core Size (micron)	Modal Bandwidth (MHz/km)	Maximum Cable Distance
SFP-GE-S	850	MMF ¹	62.5	160	722 ft (220 m)
			62.5	200	984 ft (300 m)
			50.0	400	1640 ft (500 m)
			50.0	500	1804 ft (550 m)

Table 3-8 SFP Module Port Cabling Specifications (continued)

SFP Modules	Wavelength (nm)	Fiber Type	Core Size (micron)	Modal Bandwidth (MHz/km)	Maximum Cable Distance
SFP-GE-L	1300	MMF ² and SMF	62.5	500	1804 ft (550 m)
			50.0	400	1804 ft (550 m)
			50.0	500	1804 ft (550 m)
			9/10	—	6.2 miles (10 km)
SFP-GE-Z	1550	SMF	9/10	—	49.7 miles (80 km)
		SMF ³	8	—	62.1 miles (100 km)
SFP-GE-T	N/A	Copper	N/A	N/A	328 ft. (100 m)

1. Multimode fiber (MMF) only.
2. A mode-conditioning patch cord is required.
When using the SFP-GE-L with 62.5-micron diameter MMF, you must install a mode-conditioning patch cord between the SFP module and the MMF cable on both the transmit and the receive ends of the link when link distances are greater than 984 ft (300 m).
We do not recommend using the SFP-GE-L and MMF with no patch cord for very short link distance (tens of meters). The result could be an elevated bit error rate (BER).
3. Dispersion-shifted single-mode fiber-optic cable.

**Note**

The 1000BASE-ZX SFP modules provide an optical power budget of 21.5 dB. You should measure your cable plant with an optical loss test set to verify that the optical loss of the cable plant (including connectors and splices) is less than or equal to 21.5 dB. The optical loss measurement must be performed with a 1550-nm light source.

5-Port Gigabit Ethernet SPA Overview

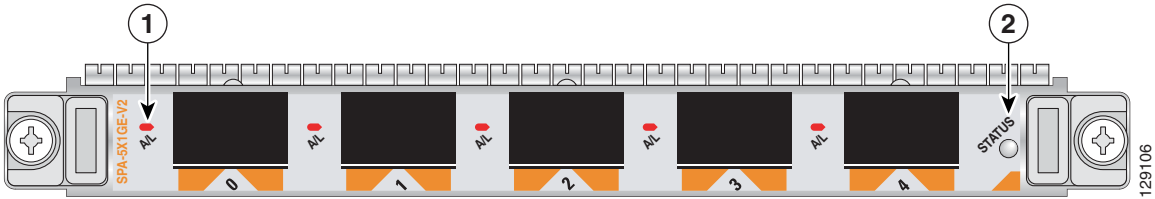
The following sections describe the 5-Port Gigabit Ethernet SPA:

- [5-Port Gigabit Ethernet SPA LEDs, page 3-11](#)
- [5-Port Gigabit Ethernet SPA Cables and Connectors, page 3-12](#)

5-Port Gigabit Ethernet SPA LEDs

The 5-Port Gigabit Ethernet SPA has two types of LEDs: an A/L LED for each individual port and a STATUS LED for the SPA, as shown in [Figure 3-6](#).

Figure 3-6 5-Port Gigabit Ethernet SPA Faceplate



1	A/L (Active/Link) LED	2	STATUS LED
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Table 3-9 describes the 5-Port Gigabit Ethernet SPA LEDs.

Table 3-9 5-Port Gigabit Ethernet SPA LEDs

LED Label	Color	State	Meaning
A/L	Off	Off	Port is not enabled.
	Green	On	Port is enabled and the link is up.
	Amber	On	Port is enabled and the link is down.
STATUS	Off	Off	SPA power is off.
	Green	On	SPA is ready and operational.
	Amber	On	SPA power is on and good, and the SPA is being configured.

5-Port Gigabit Ethernet SPA Cables and Connectors

The 5-Port Gigabit Ethernet SPA has five electrical connectors that support SFP modules. Each port can send and receive traffic using cabling appropriate for the SFP module inserted.

SFP Module Connections

The small form-factor pluggable (SFP) module is an input/output (I/O) device that plugs into the Gigabit Ethernet ports on the 5-Port Gigabit Ethernet SPA, linking the port with a fiber-optic network.



Note

The 5-Port Gigabit Ethernet SPA accepts only the SFP modules listed as supported in this document. An SFP module check is run every time an SFP module is inserted into the 5-Port Gigabit Ethernet SPA, and only SFP modules that pass this check can be used by the 5-Port Gigabit Ethernet SPA. SFP modules exist for technologies other than Gigabit Ethernet and for products other than the 5-Port Gigabit Ethernet SPA. However, the information in this document pertains only to SFP modules that plug into the 5-Port Gigabit Ethernet SPA ports.

The SFP module has a receiver port (RX) and a transmitter port (TX) that compose one optical interface. Table 3-10 and Table 3-11 provide SFP module information and specifications.

Table 3-10 SFP Module Options

SFP Module Product Number	SFP Module	Description
SFP-GE-S	Short wavelength (1000BASE-SX)	Contains a Class 1 laser of 850 nm for 1000BASE-SX (short-wavelength) applications.
SFP-GE-L	Long wavelength/long haul (1000BASE-LX/LH)	Contains a Class 1 laser of 1310 nm for 1000BASE-LX/LH (long-wavelength) applications.
SFP-GE-Z	Extended wavelength (1000BASE-ZX)	Contains a Class 1 laser of 1550 nm for 1000BASE-ZX (extended-wavelength) applications.
SFP-GE-T	RJ-45 copper SFP transceiver (1000BASE-T)	Provides full-duplex Gigabit Ethernet connectivity to high-end workstations and between wiring closets over an existing copper network infrastructure.

Table 3-11 SFP Module Specifications

Specification	Description
Wavelength	SFP-GE-S: 770 to 860 nm SFP-GE-L: 1270 to 1355 nm SFP-GE-Z: 1500 to 1580 nm SFP-GE-T: N/A.
Cabling distance (maximum)	SFP-GE-S: 500 m on 50/125um MMF; 300 m on 62.5/125um MMF SFP-GE-L: 6.2 miles (10 km) SFP-GE-Z: 49.7 miles (80 km) SFP-GE-T: 328 ft. (100 m)
Operating case temperature range	SFP-GE-S: 23 to 185 degrees F (–5 to 85 degrees C) SFP-GE-L: 23 to 185 degrees F (–5 to 85 degrees C) SFP-GE-Z: 23 to 185 degrees F (–5 to 85 degrees C) SFP-GE-T: 23 to 185 degrees F (–5 to 85 degrees C)
Storage temperature range	SFP-GE-S: –40 to 185 degrees F (–40 to 85 degrees C) SFP-GE-L: –40 to 185 degrees F (–40 to 85 degrees C) SFP-GE-Z: –40 to 185 degrees F (–40 to 85 degrees C) SFP-GE-T: –40 to 185 degrees F (–40 to 85 degrees C)
Supply voltage range	SFP-GE-S: 3.1 to 3.5 V SFP-GE-L: 3.1 to 3.5 V SFP-GE-Z: 3.1 to 3.5 V SFP-GE-T: 3.1 to 3.5 V

SFP-GE-S Modules

The 1000BASE-SX (short-wavelength) module operates on standard multimode fiber-optic link spans of up to 500 m on 50/125um multimode fiber (MMF) and 300 m on 62.5/125um MMF.

SFP-GE-L Modules

The 1000BASE-LX/LH (long-wavelength/long-haul) module interfaces fully comply with the IEEE 802.3z 1000BASE-LX standard. However, their higher optical quality allows them to reach 6.2 miles (10 km) over single-mode fiber (SMF) versus the 3.1 miles (5 km) specified in the standard.

SFP-GE-Z Modules

The 1000BASE-ZX (extended wavelength) module operates on ordinary single-mode fiber-optic link spans of up to 49.7 miles (80 km). Link spans of up to 62.1 miles (100 km) are possible using premium single-mode fiber or dispersion-shifted single-mode fiber. (Premium single-mode fiber has a lower attenuation per unit length than ordinary single-mode fiber; dispersion-shifted single-mode fiber has both lower attenuation and less dispersion.)

The 1000BASE-ZX module must be coupled to single-mode fiber-optic cable, which is the type of cable typically used in long-haul telecommunications applications. The 1000BASE-ZX module does not operate correctly when coupled to multimode fiber, and it is not intended to be used in environments in which multimode fiber is frequently used (for example, building backbones or horizontal cabling).

The 1000BASE-ZX module is intended to be used as a Physical Medium Dependent (PMD) component for Gigabit Ethernet interfaces found on various switch and router products. It operates at a signaling rate of 1250 Mbaud, transmitting and receiving 8B/10B encoded data.

When shorter lengths of single-mode fiber are used, it may be necessary to insert an inline optical attenuator in the link to avoid overloading the receiver. Use the following guidelines:

- Insert a 10-dB inline optical attenuator between the fiber-optic cable plant and the receiving port on the 1000BASE-ZX module at each end of the link whenever the fiber-optic cable span is less than 15.5 miles (25 km).
- Insert a 5-dB inline optical attenuator between the fiber-optic cable plant and the receiving port on the 1000BASE-ZX module at each end of the link whenever the fiber-optic cable span is equal to or greater than 15.5 miles (25 km) but less than 31 miles (50 km).

SFP-GE-T Modules

The SFP-GE-T (1000BASE-T copper SFP module) provides full-duplex Gigabit Ethernet connectivity to high-end workstations and between wiring closets over an existing copper network infrastructure. The SFP-GE-T maximum cabling distance is 328 feet (100 m).

SFP Module Cabling and Connection Equipment

[Table 3-12](#) provides cabling specifications for the SFP modules that can be installed on the 5-Port Gigabit Ethernet SPA. Note that all optical SFP ports have LC-type connectors.

The minimum cable distance for the SFP-GE-S is 6.5 feet (2 m), and the minimum link distance for the SFP-GE-Z is 6.2 miles (10 km) with an 8-dB attenuator installed at each end of the link. Without attenuators, the minimum link distance for the SFP-GE-Z is 24.9 miles (40 km).

Table 3-12 SFP Module Port Cabling Specifications

SFP Modules	Wavelength (nm)	Fiber Type	Core Size (micron)	Modal Bandwidth (MHz/km)	Maximum Cable Distance
SFP-GE-S	850	MMF ¹	62.5	160	722 ft (220 m)
			62.5	200	984 ft (300 m)
			50.0	400	1640 ft (500 m)
			50.0	500	1804 ft (550 m)
SFP-GE-L	1300	MMF ² and SMF	62.5	500	1804 ft (550 m)
			50.0	400	1804 ft (550 m)
			50.0	500	1804 ft (550 m)
			9/10	—	6.2 miles (10 km)
SFP-GE-Z	1550	SMF	9/10	—	49.7 miles (80 km)
		SMF ³	8	—	62.1 miles (100 km)
SFP-GE-T	N/A	Copper	N/A	N/A	328 ft. (100 m)

1. Multimode fiber (MMF) only.

2. A mode-conditioning patch cord is required.

When using the SFP-GE-L with 62.5-micron diameter MMF, you must install a mode-conditioning patch cord between the SFP module and the MMF cable on both the transmit and the receive ends of the link when link distances are greater than 984 ft (300 m).

We do not recommend using the SFP-GE-L and MMF with no patch cord for very short link distance (tens of meters). The result could be an elevated bit error rate (BER).

3. Dispersion-shifted single-mode fiber-optic cable.

**Note**

The 1000BASE-ZX SFP modules provide an optical power budget of 21.5 dB. You should measure your cable plant with an optical loss test set to verify that the optical loss of the cable plant (including connectors and splices) is less than or equal to 21.5 dB. The optical loss measurement must be performed with a 1550-nm light source.

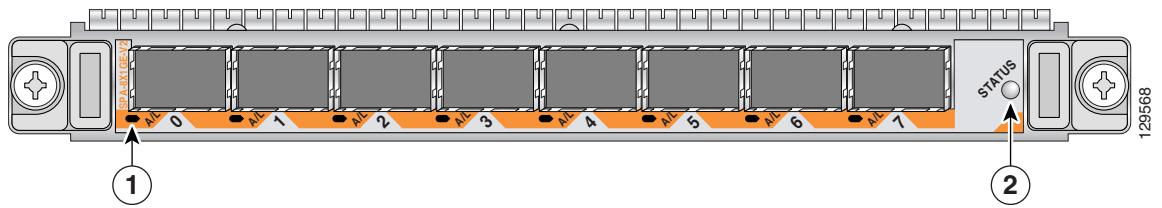
8-Port Gigabit Ethernet SPA Overview

The following sections describe the 8-Port Gigabit Ethernet SPA:

- [8-Port Gigabit Ethernet SPA LEDs, page 3-15](#)
- [8-Port Gigabit Ethernet SPA Cables and Connectors, page 3-16](#)

8-Port Gigabit Ethernet SPA LEDs

The 8-Port Gigabit Ethernet SPA has two types of LEDs: an A/L LED for each individual port and a STATUS LED for the SPA, as shown in [Figure 3-7](#).

Figure 3-7 8-Port Gigabit Ethernet SPA Faceplate

1	A/L (Active/Link) LED	2	STATUS LED
----------	-----------------------	----------	------------

Table 3-13 describes the 8-Port Gigabit Ethernet SPA LEDs.

Table 3-13 8-Port Gigabit Ethernet SPA LEDs

LED Label	Color	State	Meaning
A/L	Off	Off	Port is not enabled.
	Green	On	Port is enabled and the link is up.
	Amber	On	Port is enabled and the link is down.
STATUS	Off	Off	SPA power is off.
	Green	On	SPA is ready and operational.
	Amber	On	SPA power is on and good, and the SPA is being configured.

8-Port Gigabit Ethernet SPA Cables and Connectors

The interface connectors on the 8-Port Gigabit Ethernet SPA are eight individual fiber-optic receivers that support SFP modules. Each port can send and receive traffic using the optical fiber connections.

SFP Module Connections

The small form-factor pluggable (SFP) module is an input/output (I/O) device that plugs into the Gigabit Ethernet ports on the 8-Port Gigabit Ethernet SPA, linking the port with a fiber-optic network.



Note

The 8-Port Gigabit Ethernet SPA accepts only the SFP modules listed as supported in this document. An SFP module check is run every time an SFP module is inserted into the 8-Port Gigabit Ethernet SPA, and only SFP modules that pass this check can be used by the 8-Port Gigabit Ethernet SPA. SFP modules exist for technologies other than Gigabit Ethernet and for products other than the 8-Port Gigabit Ethernet SPA. However, the information in this document pertains only to SFP modules that plug into the 8-Port Gigabit Ethernet SPA ports.

The SFP module has a receiver port (RX) and a transmitter port (TX) that compose one optical interface. Table 3-14 and Table 3-15 provide SFP module information and specifications.

Table 3-14 SFP Module Options

SFP Module Product Number	SFP Module	Description
SFP-GE-S	Short wavelength (1000BASE-SX)	Contains a Class 1 laser of 850 nm for 1000BASE-SX (short-wavelength) applications.
SFP-GE-L	Long wavelength/long haul (1000BASE-LX/LH)	Contains a Class 1 laser of 1310 nm for 1000BASE-LX/LH (long-wavelength) applications.
SFP-GE-Z	Extended wavelength (1000BASE-ZX)	Contains a Class 1 laser of 1550 nm for 1000BASE-ZX (extended-wavelength) applications.

Table 3-15 SFP Module Specifications

Specification	Description
Wavelength	SFP-GE-S: 770 to 860 nm SFP-GE-L: 1270 to 1355 nm SFP-GE-Z: 1500 to 1580 nm
Cabling distance (maximum)	SFP-GE-S: 500 m on 50/125um MMF; 300 m on 62.5/125um MMF SFP-GE-L: 6.2 miles (10 km) SFP-GE-Z: 49.7 miles (80 km)
Operating case temperature range	SFP-GE-S: 23 to 185 degrees F (–5 to 85 degrees C) SFP-GE-L: 23 to 185 degrees F (–5 to 85 degrees C) SFP-GE-Z: 23 to 185 degrees F (–5 to 85 degrees C)
Storage temperature range	SFP-GE-S: –40 to 185 degrees F (–40 to 85 degrees C) SFP-GE-L: –40 to 185 degrees F (–40 to 85 degrees C) SFP-GE-Z: –40 to 185 degrees F (–40 to 85 degrees C)
Supply voltage range	SFP-GE-S: 3.1 to 3.5 V SFP-GE-L: 3.1 to 3.5 V SFP-GE-Z: 3.1 to 3.5 V

SFP-GE-S Modules

The 1000BASE-SX (short-wavelength) module operates on standard multimode fiber-optic link spans of up to 500 m on 50/125um multimode fiber (MMF) and 300 m on 62.5/125um MMF.

SFP-GE-L Modules

The 1000BASE-LX/LH (long-wavelength/long-haul) module interfaces fully comply with the IEEE 802.3z 1000BASE-LX standard. However, their higher optical quality allows them to reach 6.2 miles (10 km) over single-mode fiber (SMF) versus the 3.1 miles (5 km) specified in the standard.

SFP-GE-Z Modules

The 1000BASE-ZX (extended-wavelength) module operates on ordinary single-mode fiber-optic link spans of up to 49.7 miles (80 km). Link spans of up to 62.1 miles (100 km) are possible using premium single-mode fiber or dispersion-shifted single-mode fiber. (Premium single-mode fiber has a lower attenuation per unit length than ordinary single-mode fiber; dispersion-shifted single-mode fiber has both lower attenuation and less dispersion.)

The 1000BASE-ZX module must be coupled to single-mode fiber-optic cable, which is the type of cable typically used in long-haul telecommunications applications. The 1000BASE-ZX module does not operate correctly when coupled to multimode fiber, and it is not intended to be used in environments in which multimode fiber is frequently used (for example, building backbones or horizontal cabling).

The 1000BASE-ZX module is intended to be used as a Physical Medium Dependent (PMD) component for Gigabit Ethernet interfaces found on various switch and router products. It operates at a signaling rate of 1250 Mbaud, transmitting and receiving 8B/10B encoded data.

When shorter lengths of single-mode fiber are used, it may be necessary to insert an inline optical attenuator in the link to avoid overloading the receiver. Use the following guidelines:

- Insert a 10-dB inline optical attenuator between the fiber-optic cable plant and the receiving port on the 1000BASE-ZX module at each end of the link whenever the fiber-optic cable span is less than 15.5 miles (25 km).
- Insert a 5-dB inline optical attenuator between the fiber-optic cable plant and the receiving port on the 1000BASE-ZX module at each end of the link whenever the fiber-optic cable span is equal to or greater than 15.5 miles (25 km) but less than 31 miles (50 km).

SFP Module Cabling and Connection Equipment

Table 3-16 provides cabling specifications for the SFP modules that can be installed on the 8-Port Gigabit Ethernet SPA. Note that all optical SFP ports have LC-type connectors.

The minimum cable distance for the SFP-GE-S is 6.5 feet (2 m), and the minimum link distance for the SFP-GE-Z is 6.2 miles (10 km) with an 8-dB attenuator installed at each end of the link. Without attenuators, the minimum link distance for the SFP-GE-Z is 24.9 miles (40 km).

Table 3-16 SFP Module Port Cabling Specifications

SFP Modules	Wavelength (nm)	Fiber Type	Core Size (micron)	Modal Bandwidth (MHz/km)	Maximum Cable Distance
SFP-GE-S	850	MMF ¹	62.5	160	722 ft (220 m)
			62.5	200	984 ft (300 m)
			50.0	400	1640 ft (500 m)
			50.0	500	1804 ft (550 m)
SFP-GE-L	1300	MMF ² and SMF	62.5	500	1804 ft (550 m)
			50.0	400	1804 ft (550 m)
			50.0	500	1804 ft (550 m)
			9/10	—	6.2 miles (10 km)
SFP-GE-Z	1550	SMF	9/10	—	49.7 miles (80 km)
		SMF ³	8	—	62.1 miles (100 km)

1. Multimode fiber (MMF) only.
2. A mode-conditioning patch cord is required.
When using the SFP-GE-L with 62.5-micron diameter MMF, you must install a mode-conditioning patch cord between the SFP module and the MMF cable on both the transmit and the receive ends of the link when link distances are greater than 984 ft (300 m).
We do not recommend using the SFP-GE-L and MMF with no patch cord for very short link distance (tens of meters). The result could be an elevated bit error rate (BER).
3. Dispersion-shifted single-mode fiber-optic cable.

**Note**

The 1000BASE-ZX SFP modules provide an optical power budget of 21.5 dB. You should measure your cable plant with an optical loss test set to verify that the optical loss of the cable plant (including connectors and splices) is less than or equal to 21.5 dB. The optical loss measurement must be performed with a 1550-nm light source.



CHAPTER 4

Preparing to Install a SIP or a SPA

This chapter describes the general equipment, safety, and site preparation requirements for installing SIPs and SPAs. This chapter contains the following sections:

- [Required Tools and Equipment, page 4-1](#)
- [Safety Guidelines, page 4-1](#)
- [Laser/LED Safety, page 4-7](#)

Required Tools and Equipment

You need the following tools and parts to install SIPs and SPAs. If you need additional equipment, contact a service representative for ordering information.

- Shared port adapter interface processor (SIP)
- Shared port adapter (SPA)
- Number 1 Phillips and a 3/16-inch flat-blade screwdriver
- Number 2 Phillips screwdriver
- Your own electrostatic discharge (ESD)-prevention equipment or the disposable grounding wrist strap supplied with the SIP or SPA
- Antistatic mat
- Antistatic container

Safety Guidelines

This section provides safety guidelines that you should follow when working with any equipment that connects to electrical power or telephone wiring.

Safety Warnings

Safety warnings appear throughout this publication in procedures that, if performed incorrectly, might harm you. A warning symbol precedes each warning statement.

Warning Definition



Warning

IMPORTANT SAFETY INSTRUCTIONS

This warning symbol means danger. You are in a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents. Use the statement number provided at the end of each warning to locate its translation in the translated safety warnings that accompanied this device. Statement 1071

SAVE THESE INSTRUCTIONS

Waarschuwing

BELANGRIJKE VEILIGHEIDSINSTRUCTIES

Dit waarschuwingssymbool betekent gevaar. U verkeert in een situatie die lichamelijk letsel kan veroorzaken. Voordat u aan enige apparatuur gaat werken, dient u zich bewust te zijn van de bij elektrische schakelingen betrokken risico's en dient u op de hoogte te zijn van de standaard praktijken om ongelukken te voorkomen. Gebruik het nummer van de verklaring onderaan de waarschuwing als u een vertaling van de waarschuwing die bij het apparaat wordt geleverd, wilt raadplegen.

BEWAAR DEZE INSTRUCTIES

Varoitus

TÄRKEITÄ TURVALLISUUSOHJEITA

Tämä varoitusmerkki merkitsee vaaraa. Tilanne voi aiheuttaa ruumiillisia vammoja. Ennen kuin käsittelet laitteistoa, huomioi sähköpiirien käsittelymiseen liittyvät riskit ja tutustu onnettomuuksien yleisiin ehkäisytapoihin. Turvallisuusvaroitusten käännökset löytyvät laitteen mukana toimitettujen käännettyjen turvallisuusvaroitusten joukosta varoitusten lopussa näkyvien lausuntonumeroiden avulla.

SÄILYTÄ NÄMÄ OHJEET

Attention

IMPORTANTES INFORMATIONS DE SÉCURITÉ

Ce symbole d'avertissement indique un danger. Vous vous trouvez dans une situation pouvant entraîner des blessures ou des dommages corporels. Avant de travailler sur un équipement, soyez conscient des dangers liés aux circuits électriques et familiarisez-vous avec les procédures couramment utilisées pour éviter les accidents. Pour prendre connaissance des traductions des avertissements figurant dans les consignes de sécurité traduites qui accompagnent cet appareil, référez-vous au numéro de l'instruction situé à la fin de chaque avertissement.

CONSERVEZ CES INFORMATIONS

Warnung

WICHTIGE SICHERHEITSHINWEISE

Dieses Warnsymbol bedeutet Gefahr. Sie befinden sich in einer Situation, die zu Verletzungen führen kann. Machen Sie sich vor der Arbeit mit Geräten mit den Gefahren elektrischer Schaltungen und den üblichen Verfahren zur Vorbeugung vor Unfällen vertraut. Suchen Sie mit der am Ende jeder Warnung angegebenen Anweisungsnummer nach der jeweiligen Übersetzung in den übersetzten Sicherheitshinweisen, die zusammen mit diesem Gerät ausgeliefert wurden.

BEWAHREN SIE DIESE HINWEISE GUT AUF.

Avvertenza IMPORTANTI ISTRUZIONI SULLA SICUREZZA

Questo simbolo di avvertenza indica un pericolo. La situazione potrebbe causare infortuni alle persone. Prima di intervenire su qualsiasi apparecchiatura, occorre essere al corrente dei pericoli relativi ai circuiti elettrici e conoscere le procedure standard per la prevenzione di incidenti. Utilizzare il numero di istruzione presente alla fine di ciascuna avvertenza per individuare le traduzioni delle avvertenze riportate in questo documento.

CONSERVARE QUESTE ISTRUZIONI

Advarsel VIKTIGE SIKKERHETSINSTRUKSJONER

Dette advarselssymbolet betyr fare. Du er i en situasjon som kan føre til skade på person. Før du begynner å arbeide med noe av utstyret, må du være oppmerksom på farene forbundet med elektriske kretser, og kjenne til standardprosedyrer for å forhindre ulykker. Bruk nummeret i slutten av hver advarsel for å finne oversettelsen i de oversatte sikkerhetsadvarslene som fulgte med denne enheten.

TA VARE PÅ DISSE INSTRUKSJONENE

Aviso INSTRUÇÕES IMPORTANTES DE SEGURANÇA

Este símbolo de aviso significa perigo. Você está em uma situação que poderá ser causadora de lesões corporais. Antes de iniciar a utilização de qualquer equipamento, tenha conhecimento dos perigos envolvidos no manuseio de circuitos elétricos e familiarize-se com as práticas habituais de prevenção de acidentes. Utilize o número da instrução fornecido ao final de cada aviso para localizar sua tradução nos avisos de segurança traduzidos que acompanham este dispositivo.

GUARDE ESTAS INSTRUÇÕES

¡Advertencia! INSTRUCCIONES IMPORTANTES DE SEGURIDAD

Este símbolo de aviso indica peligro. Existe riesgo para su integridad física. Antes de manipular cualquier equipo, considere los riesgos de la corriente eléctrica y familiarícese con los procedimientos estándar de prevención de accidentes. Al final de cada advertencia encontrará el número que le ayudará a encontrar el texto traducido en el apartado de traducciones que acompaña a este dispositivo.

GUARDE ESTAS INSTRUCCIONES

Varning! VIKTIGA SÄKERHETSANVISNINGAR

Denna varningssignal signalerar fara. Du befinner dig i en situation som kan leda till personskada. Innan du utför arbete på någon utrustning måste du vara medveten om farorna med elkretsar och känna till vanliga förfaranden för att förebygga olyckor. Använd det nummer som finns i slutet av varje varning för att hitta dess översättning i de översatta säkerhetsvarningar som medföljer denna anordning.

SPARA DESSA ANVISNINGAR

Figyelem

FONTOS BIZTONSÁGI ELOÍRÁSOK

Ez a figyelmeztető jel veszélyre utal. Sérülésveszélyt rejtő helyzetben van. Mielott bármely berendezésen munkát végezze, legyen figyelemmel az elektromos áramkörök okozta kockázatokra, és ismerkedjen meg a szokásos balesetvédelmi eljárásokkal. A kiadványban szereplő figyelmeztetések fordítása a készülékhez mellékelt biztonsági figyelmeztetések között található; a fordítás az egyes figyelmeztetések végén látható szám alapján kereshető meg.

ORIZZE MEG EZEKET AZ UTASÍTÁSOKAT!

Предупреждение

ВАЖНЫЕ ИНСТРУКЦИИ ПО СОБЛЮДЕНИЮ ТЕХНИКИ БЕЗОПАСНОСТИ

Этот символ предупреждения обозначает опасность. То есть имеет место ситуация, в которой следует опасаться телесных повреждений. Перед эксплуатацией оборудования выясните, каким опасностям может подвергаться пользователь при использовании электрических цепей, и ознакомьтесь с правилами техники безопасности для предотвращения возможных несчастных случаев. Воспользуйтесь номером заявления, приведенным в конце каждого предупреждения, чтобы найти его переведенный вариант в переводе предупреждений по безопасности, прилагаемом к данному устройству.

СОХРАНИТЕ ЭТИ ИНСТРУКЦИИ

警告

重要的安全性说明

此警告符号代表危险。您正处于可能受到严重伤害的工作环境中。在您使用设备开始工作之前，必须充分意识到触电的危险，并熟练掌握防止事故发生的标准工作程序。请根据每项警告结尾提供的声明号码来找到此设备的安全性警告说明的翻译文本。

请保存这些安全性说明

警告

安全上の重要な注意事項

「危険」の意味です。人身事故を予防するための注意事項が記述されています。装置の取り扱い作業を行うときは、電気回路の危険性に注意し、一般的な事故防止策に留意してください。警告の各国語版は、各注意事項の番号を基に、装置に付属の「Translated Safety Warnings」を参照してください。

これらの注意事項を保管しておいてください。

주의

중요 안전 지침

이 경고 기호는 위험을 나타냅니다. 작업자가 신체 부상을 일으킬 수 있는 위험한 환경에 있습니다. 장비에 작업을 수행하기 전에 전기 회로와 관련된 위험을 숙지하고 표준 작업 관례를 숙지하여 사고를 방지하십시오. 각 경고의 마지막 부분에 있는 경고문 번호를 참조하여 이 장치와 함께 제공되는 번역된 안전 경고문에서 해당 번역문을 찾으십시오.

이 지시 사항을 보관하십시오.

تحذير

إرشادات الأمان الهامة

يوضح رمز التحذير هذا وجود خطر. وهذا يعني أنك متواجد في مكان قد ينتج عنه التعرض لإصابات. قبل بدء العمل، احذر مخاطر التعرض للصدمات الكهربائية وكن على علم بالإجراءات القياسية للحيلولة دون وقوع أي حوادث. استخدم رقم البيان الموجود في آخر كل تحذير لتحديد مكان ترجمته داخل تحذيرات الأمان المترجمة التي تأتي مع الجهاز. قم بحفظ هذه الإرشادات

Upozorenje

VAŽNE SIGURNOSNE NAPOMENE

Ovaj simbol upozorenja predstavlja opasnost. Nalazite se u situaciji koja može prouzročiti tjelesne ozljede. Prije rada s bilo kojim uređajem, morate razumjeti opasnosti vezane uz električne sklopove, te biti upoznati sa standardnim načinima izbjegavanja nesreća. U prevedenim sigurnosnim upozorenjima, priloženima uz uređaj, možete prema broju koji se nalazi uz pojedino upozorenje pronaći i njegov prijevod.

SAČUVAJTE OVE UPUTE

Upozornění

DŮLEŽITÉ BEZPEČNOSTNÍ POKYNY

Tento upozorňující symbol označuje nebezpečí. Jste v situaci, která by mohla způsobit nebezpečí úrazu. Před prací na jakémkoliv vybavení si uvědomte nebezpečí související s elektrickými obvody a seznamte se se standardními opatřeními pro předcházení úrazům. Podle čísla na konci každého upozornění vyhledejte jeho překlad v přeložených bezpečnostních upozorněních, která jsou přiložena k zařízení.

USCHOVEJTE TYTO POKYNY

Προειδοποίηση

ΣΗΜΑΝΤΙΚΕΣ ΟΔΗΓΙΕΣ ΑΣΦΑΛΕΙΑΣ

Αυτό το προειδοποιητικό σύμβολο σημαίνει κίνδυνο. Βρίσκεστε σε κατάσταση που μπορεί να προκαλέσει τραυματισμό. Πριν εργαστείτε σε οποιοδήποτε εξοπλισμό, να έχετε υπόψη σας τους κινδύνους που σχετίζονται με τα ηλεκτρικά κυκλώματα και να έχετε εξοικειωθεί με τις συνήθειες πρακτικές για την αποφυγή ατυχημάτων. Χρησιμοποιήστε τον αριθμό δήλωσης που παρέχεται στο τέλος κάθε προειδοποίησης, για να εντοπίσετε τη μετάφρασή της στις μεταφρασμένες προειδοποιήσεις ασφαλείας που συνοδεύουν τη συσκευή.

ΦΥΛΑΞΤΕ ΑΥΤΕΣ ΤΙΣ ΟΔΗΓΙΕΣ

אזהרה

הוראות בטיחות חשובות

סימן אזהרה זה מסמל סכנה. אתה נמצא במצב העלול לגרום לפציעה. לפני שתעבוד עם ציוד כלשהו, עליך להיות מודע לסכנות הכרוכות במעגלים חשמליים ולהכיר את הנהלים המקובלים למניעת תאונות. השתמש במספר ההוראה המסופק בסופה של כל אזהרה כדי לאתר את התרגום באזהרות הבטיחות המתורגמות שמצורפות להתקן.

שמור הוראות אלה

Ostrzeżenie WAŻNE INSTRUKCJE DOTYCZĄCE BEZPIECZEŃSTWA

Ten symbol ostrzeżenia oznacza niebezpieczeństwo. Zachodzi sytuacja, która może powodować obrażenia ciała. Przed przystąpieniem do prac przy urządzeniach należy zapoznać się z zagrożeniami związanymi z układami elektrycznymi oraz ze standardowymi środkami zapobiegania wypadkom. Na końcu każdego ostrzeżenia podano numer, na podstawie którego można odszukać tłumaczenie tego ostrzeżenia w dołączonym do urządzenia dokumencie z tłumaczeniami ostrzeżeń.

NINIEJSZE INSTRUKCJE NALEŻY ZACHOWAĆ**Upozornenie DÔLEŽITÉ BEZPEČNOSTNÉ POKYNY**

Tento varovný symbol označuje nebezpečenstvo. Nachádzate sa v situácii s nebezpečenstvom úrazu. Pred prácou na akomkoľvek vybavení si uvedomte nebezpečenstvo súvisiace s elektrickými obvodmi a oboznámte sa so štandardnými opatreniami na predchádzanie úrazom. Podľa čísla na konci každého upozornenia vyhľadajte jeho preklad v preložených bezpečnostných upozorneniach, ktoré sú priložené k zariadeniu.

USCHOVAJTE SI TENTO NÁVOD

Electrical Equipment Guidelines

Follow these basic guidelines when working with any electrical equipment:

- Before beginning any procedures requiring access to the chassis interior, locate the emergency power-off switch for the room in which you are working.
- Disconnect all power and external cables before moving a chassis.
- Do not work alone when potentially hazardous conditions exist.
- Never assume that power has been disconnected from a circuit; always check.
- Do not perform any action that creates a potential hazard to people or makes the equipment unsafe; carefully examine your work area for possible hazards such as moist floors, ungrounded power extension cables, and missing safety grounds.



Caution

This equipment is suitable for intra-building wiring only.

Telephone Wiring Guidelines

Use the following guidelines when working with any equipment that is connected to telephone wiring or to other network cabling:

- Never install telephone wiring during a lightning storm.
- Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations.

- Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.
- Use caution when installing or modifying telephone lines.

Preventing Electrostatic Discharge Damage

Electrostatic discharge (ESD) damage, which can occur when electronic cards or components are improperly handled, results in complete or intermittent failures. SIPs, SPAs, and processor modules comprise printed circuit boards that are fixed in metal carriers. Electromagnetic interference (EMI) shielding and connectors are integral components of the carrier. Although the metal carrier helps to protect the board from ESD, use a preventive antistatic strap during handling.

Following are guidelines for preventing ESD damage:

- Always use an ESD wrist or ankle strap and ensure that it makes good skin contact.
- Connect the equipment end of the strap to an unfinished chassis surface.
- When installing a component, use any available ejector levers or captive installation screws to properly seat the bus connectors in the backplane or midplane. These devices prevent accidental removal, provide proper grounding for the system, and help to ensure that bus connectors are properly seated.
- When removing a component, use any available ejector levers or captive installation screws to release the bus connectors from the backplane or midplane.
- Handle carriers by available handles or edges only; avoid touching the printed circuit boards or connectors.
- Place a removed board component-side-up on an antistatic surface or in a static shielding container. If you plan to return the component to the factory, immediately place it in a static shielding container.
- Avoid contact between the printed circuit boards and clothing. The wrist strap only protects components from ESD voltages on the body; ESD voltages on clothing can still cause damage.
- Never attempt to remove the printed circuit board from the metal carrier.



Caution

For safety, periodically check the resistance value of the antistatic strap. The measurement should be between 1 and 10 megohms (Mohms).

Laser/LED Safety

An optical single-mode transmitter uses a small laser to transmit the light signal to the network ring. Keep the transmit port covered whenever a cable is not connected to it. Although multimode transceivers typically use LEDs for transmission, it is good practice to keep open ports covered and avoid staring into open ports or apertures. The single-mode aperture port contains a laser warning label, as shown in [Figure 4-1](#). The multimode aperture contains a Class 1 LED warning label, as shown in [Figure 4-1](#). These warnings apply to SPAs and SFP modules that transmit signals via an optical carrier signal.

Figure 4-1 Class 1 Laser Warning Labels for Single-Mode Port**Warning****Class 1 laser product.** Statement 1008**Warning****Invisible laser radiation may be emitted from disconnected fibers or connectors. Do not stare into beams or view directly with optical instruments.** Statement 1051**Waarschuwing****Losgekoppelde of losgeraakte glasvezels of aansluitingen kunnen onzichtbare laserstraling produceren. Kijk niet rechtstreeks in de straling en gebruik geen optische instrumenten rond deze glasvezels of aansluitingen.****Varoitus****Irrotetuista kuiduista tai liittimistä voi tulla näkymätöntä lasersäteilyä. Älä tuijota säteitä tai katso niitä suoraan optisilla välineillä.****Attention****Les fibres ou connecteurs débranchés risquent d'émettre des rayonnements laser invisibles à l'œil. Ne regardez jamais directement les faisceaux laser à l'œil nu, ni d'ailleurs avec des instruments optiques.****Warnung****Unterbrochene Fasern oder Steckerverbindungen können unsichtbare Laserstrahlung abgeben. Blicken Sie weder mit bloßem Auge noch mit optischen Instrumenten direkt in Laserstrahlen.****Avvertenza****Le fibre ottiche ed i relativi connettori possono emettere radiazioni laser. I fasci di luce non devono mai essere osservati direttamente o attraverso strumenti ottici.****Advarsel****Det kan forekomme usynlig laserstråling fra fiber eller kontakter som er frakoblet. Stirr ikke direkte inn i strålene eller se på dem direkte gjennom et optisk instrument.****Aviso****Radiação laser invisível pode ser emitida de conectores ou fibras desconectadas. Não olhe diretamente para os feixes ou com instrumentos ópticos.****¡Advertencia!****Es posible que las fibras desconectadas emitan radiación láser invisible. No fije la vista en los rayos ni examine éstos con instrumentos ópticos.****Varning!****Osynlig laserstrålning kan avges från fränkopplade fibrer eller kontaktdon. Rikta inte blicken in i strålar och titta aldrig direkt på dem med hjälp av optiska instrument.****Figyelem****A nem csatlakoztatott üvegszálak és csatlakozók láthatatlan lézersugárzást bocsáthatnak ki. Ne nézzen bele a sugárba, és ne nézze közvetlenül, optikai berendezések segítségével!**

Предупреждение	Отключенные световоды и разъемы могут испускать невидимое лазерное излучение. Не допускайте попадания лазерного луча в глаза и не смотрите на него через оптические приборы.
警告	断开的光纤或接头有可能发出不可见的激光辐射。请勿直视光束或直接用光学仪器观看光束。
警告	光ファイバ ケーブルまたはコネクタを取り外した状態では、目に見えないレーザー光が放射されていることがあります。光線をのぞきこんだり、光学機器を使用して光線を直接見たりしないでください。
주의	연결이 해제된 섬유나 커넥터에서 눈에 보이지 않는 레이저 방사열이 방출될 수 있습니다. 레이저 빔을 눈으로 쳐다 보거나 광학 기구를 사용하여 직접 보지 마십시오.
Aviso	Radiação laser invisível pode ser emitida a partir de fibras ou conectores desconectados. Não fixe o olhar nos feixes e nem olhe diretamente com instrumentos ópticos.
Advarsel	Usynlig laserstråling kan forekomme fra brugte fibre eller stik. Stir ikke ind i stråler eller direkte med optiske instrumenter.
تحذير	من المحتمل انبعاث أشعة الليزر من الألياف غير المتصلة أو التوصيلات. لا تحقق النظر في الشعاع أو النظر مباشرة بدون أي أداة بصرية.
Upozornění	Odpojená vlákna kabelů či konektory mohou vyzařovat neviditelné laserové záření. Nedívejte se do paprsků ani nepozorujte přímo pomocí optických přístrojů.
Προειδοποίηση	Από αποσυνδεδεμένες ίνες ή υποδοχές μπορεί να εκπέμπεται αόρατη ακτινοβολία λέιζερ. Μην κοιτάτε απευθείας τις δέσμες φωτός και μην τις απεικονίζετε απευθείας με οπτικά όργανα.
אזהרה	תתיכן פליטה של קרינת לייזר בלתי-נראית מסיבים או ממחברים מנותקים. אל תביט ישירות לתוך קרני אור ואל תביט באמצעות במכשירים אופטיים.
Ороромона	Невидливо ласерско зрачење може да зрачи од исклучените влакна или приклучоци. Не гледајте во зраци и не прегледувајте ги директно со оптички инструменти.

Ostrzeżenie Odłączone światłowody lub złącza mogą emitować niewidzialne promieniowanie laserowe. Nie należy patrzeć prosto w wiązkę lasera ani bezpośrednio obserwować jej przy użyciu przyrządów optycznych.

Upozornenie Odpojené vlákna káblov alebo konektory môžu vyžarovať neviditeľné laserové žiarenie. Nepozerajte sa do lúčov ani ich nepozorujte priamo pomocou optických prístrojov.

T

**Warning**

Invisible laser radiation may be emitted from disconnected fibers or connectors. Do not stare into beams or view directly with optical instruments. Statement 1051

**Warning**

Class 1 LED product. Statement 1027



CHAPTER 5

Installing and Removing a SIP

This chapter describes how to install or remove SIPs on a Cisco 10000 series router. This chapter contains the following sections:

- [Handling SIPs, page 5-1](#)
- [Online Insertion and Removal of a SIP, page 5-2](#)
- [SIP Installation and Removal, page 5-5](#)

Handling SIPs

Each SIP circuit board is mounted to a metal carrier and is sensitive to electrostatic discharge (ESD) damage. Before you begin installation, read [Chapter 4, “Preparing to Install a SIP or a SPA,”](#) for a list of parts and tools required for installation.

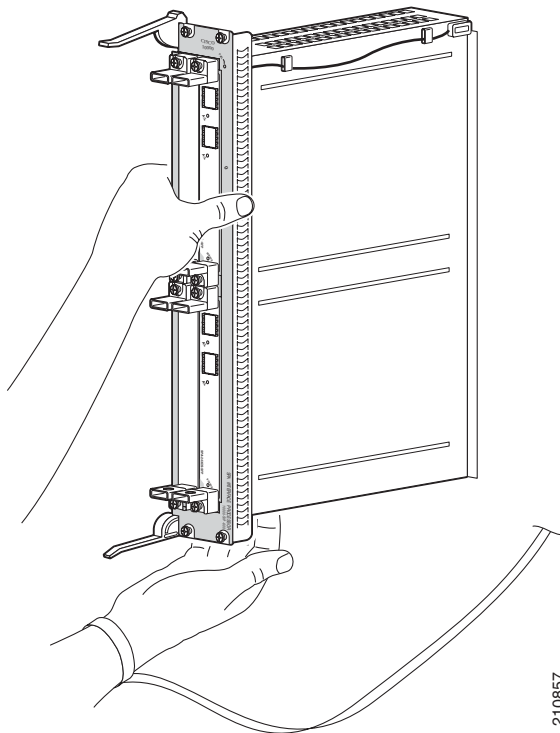


Caution

Always handle the SIP by the carrier edges; never touch the SIP components or connector pins (see [Figure 5-1](#)).

When a slot is not in use, a blank filler plate must be installed in the empty slot to allow the router to conform to electromagnetic interference (EMI) emissions requirements and to allow proper airflow across the installed modules. If you plan to install a SIP in a slot that is not in use, you must first remove the two blank filler plates.

Figure 5-1 Handling a Cisco 10000 SIP-600



Caution

The Cisco 10000 SIP-600 weighs 10 lb (4.6 kg). Always use two hands when handling the SIP.

Online Insertion and Removal of a SIP

The Cisco 10000 series router supports online insertion and removal (OIR) of the SPA interface processor (SIP) and of the shared port adapters (SPAs). Therefore, you can remove a SIP with its SPAs still intact, or you can remove a SPA independently from the SIP, leaving the SIP installed in the router. To remove a SPA, refer to [Chapter 6, “Installing and Removing a SPA”](#).

Although graceful deactivation of a SIP is preferred using the **hw-module slot shutdown command**, the Cisco 10000 series router does support removal of the SIP without deactivating it first. If you plan to remove a SIP, you can deactivate the SIP first, using the **hw-module slot shutdown command** in global configuration mode. When you deactivate a SIP using this command, it automatically deactivates each of the SPAs that are installed in that SIP. Therefore, it is not necessary to deactivate each of the SPAs prior to deactivating the SIP.

For information about the recommended procedures for physical removal of the SIP, refer to the [“Removing a SIP” section on page 5-8](#).

Deactivating a SIP

To deactivate a SIP and its installed SPAs prior to removal of the SIP, use the following command in global configuration mode:

Command	Purpose
<code>Router(config)# hw-module slot slot shutdown</code>	Shuts down any installed interfaces, and deactivates the SIP in the specified slot, where: <i>slot</i>—Specifies the chassis slot number where the SIP is installed.

Reactivating a SIP

Once you deactivate a SIP, whether or not you have performed an OIR, you must use the **no hw-module slot shutdown** command in global configuration mode to reactivate the SIP.

If you did not issue a command to deactivate the SPAs installed in a SIP, but you did deactivate the SIP using the **no hw-module slot shutdown** command, then you do not need to reactivate the SPAs after an OIR of the SIP. The installed SPAs automatically reactivate upon reactivation of the SIP in the router.

For example, consider the case where you remove a SIP from the router to replace it with another SIP. You reinstall the same SPAs into the new SIP. When you enter the **no hw-module slot shutdown** command on the router, the SPAs automatically reactivate with the new SIP.

To activate a SIP and its installed SPAs after the SIP has been deactivated, use the following command in global configuration mode:

Command	Purpose
<code>Router(config)# no hw-module slot slot shutdown</code>	Activates the SIP in the specified slot and its installed SPAs, where: <i>slot</i>—Specifies the chassis slot number where the SIP is installed.

Verifying the Status of a SIP

To view the status of a SIP, use the **show diag** command in privileged EXEC configuration mode.

```
Router# show diag 1/0
```

```
Slot/Subslot 1/0:
  4jacket-1 card, 0 ports
  Card is full slot size
  Card is analyzed
  Card detected 07:42:30 ago
  Card uptime 0 days, 7 hours, 42 minutes, 31 seconds
  Card idle time 0 days, 3 hours, 3 minutes, 17 seconds
  Voltage status:
EEPROM contents, slot 1/0:
  Controller Type       : 1380
  Hardware Revision     : 1.0
  PCB Part Number      : 73-10771-01
  Board Revision       :
```

```

Deviation Number       : 0-0
Fab Version            : 01
PCB Serial Number      : CSJ10497186
RMA Test History       : 00
RMA Number             : 0-0-0-0
RMA History            : 00
Top Assy. Part Number  : 800-27953-01
CLEI Code              : UNASSIGNED
Product Identifier (PID) : 10000-SIP-600
Version Identifier (VID) : V00
LCMON version, slot 1/0
  LCDOS (C10000 PowerQUICC-III Line Card MONitor Image : DEVELOPMENT BUILD
jktotelly-spumoni_lc /vob/lcdos/obj-c10k-pq3-lcmon 102
)
  Built by jktotelly at Thu Nov  9 10:54:20 2006.
  Reset reason 0x00000008 (PRE hard reset).
Operational Image version, slot 1/0
  LCDOS (C10000 4 SPA Jacket Card Image (Spumoni) : DEVELOPMENT BUILD
BLD-mayflower_lc.lcdos-nightly-mayflower-c10k /vob/lcdos/ob
j-c10k-spumoni 102) major version 1189663592.
  Built by ashah at Thu Sep 13 02:08:59 2007.
  SW Version 4.0
  Code MD5 068FBA5273DC8F598CC66E34D867A197
  FPGA MD5 89C8DD3DCD939BDD43DB19D514416137
  Expected Switchover Action: NO ACTION
  ECC 1 bit errors since last cleared (dd hh mm ss) = 0 (0 days, 0 hours, 0 minutes,
0 seconds)
  ECC 1 bit errors while up (total) = 0
  Number of crashdumps recorded = 8

  SPA Information:
subslot 1/0   SPA-5X1GE-V2      ok

  SW Version 1.0
  Expected Switchover Action: NO ACTION
  Product Identifier (PID) : SPA-5X1GE-V2
  Version Identifier (VID) : V01
  PCB Serial Number       : JAB105201VV
  Top Assy. Part Number   : 68-2616-01
  Top Assy. Revision      : D0
  Hardware Revision       : 1.1
  CLEI Code               : CNUIANAAAA
  The Transceiver in slot 1 subslot 0 port 0 is ENABLED.
  The Transceiver in slot 1 subslot 0 port 1 is ENABLED.
  The Transceiver in slot 1 subslot 0 port 2 is ENABLED.
  The Transceiver in slot 1 subslot 0 port 3 is ENABLED.
  The Transceiver in slot 1 subslot 0 port 4 is ENABLED.

  SPA Information:
subslot 1/1   SPA-5X1GE-V2      ok

  SW Version 1.0
  Expected Switchover Action: NO ACTION
  Product Identifier (PID) : SPA-5X1GE-V2
  Version Identifier (VID) : V01
  PCB Serial Number       : JAB110202HP
  Top Assy. Part Number   : 68-2616-01
  Top Assy. Revision      : E0
  Hardware Revision       : 1.1
  CLEI Code               : CNUIANAAAA
  The Transceiver in slot 1 subslot 1 port 0 is ENABLED.
  The Transceiver in slot 1 subslot 1 port 1 is ENABLED.
  The Transceiver in slot 1 subslot 1 port 2 is ENABLED.

```

```

The Transceiver in slot 1 subslot 1 port 3 is ENABLED.
The Transceiver in slot 1 subslot 1 port 4 is ENABLED.

SPA Information:
subslot 1/2   SPA-5X1GE-V2           ok

SW Version 1.0
Expected Switchover Action: NO ACTION
Product Identifier (PID) : SPA-5X1GE-V2
Version Identifier (VID) : V01
PCB Serial Number       : JAB1042060D
Top Assy. Part Number   : 68-2616-01
Top Assy. Revision      : D0
Hardware Revision       : 1.1
CLEI Code               : CNUIANAAAA
The Transceiver in slot 1 subslot 2 port 0 is ENABLED.
The Transceiver in slot 1 subslot 2 port 1 is ENABLED.
The Transceiver in slot 1 subslot 2 port 2 is ENABLED.
The Transceiver in slot 1 subslot 2 port 3 is ENABLED.
The Transceiver in slot 1 subslot 2 port 4 is ENABLED.

SPA Information:
subslot 1/3   SPA-5X1GE-V2           ok

SW Version 1.0
Expected Switchover Action: NO ACTION
Product Identifier (PID) : SPA-5X1GE-V2
Version Identifier (VID) : V01
PCB Serial Number       : JAB110202GA
Top Assy. Part Number   : 68-2616-01
Top Assy. Revision      : E0
Hardware Revision       : 1.1
CLEI Code               : CNUIANAAAA
The Transceiver in slot 1 subslot 3 port 0 is ENABLED.
The Transceiver in slot 1 subslot 3 port 1 is ENABLED.
The Transceiver in slot 1 subslot 3 port 2 is ENABLED.
The Transceiver in slot 1 subslot 3 port 3 is ENABLED.
The Transceiver in slot 1 subslot 3 port 4 is ENABLED.

Router#

```

SIP Installation and Removal

This section provides step-by-step instructions for installing and removing a SIP.



Warning

When performing the following procedures, wear a grounding wrist strap to avoid ESD damage to the SIP. Some platforms have an ESD connector for attaching the wrist strap. Do not directly touch the midplane or backplane with your hand or any metal tool, or you could shock yourself.



Caution

Install or remove only one SIP at a time. Be sure to verify that each SIP is fully installed and secured before installing another SIP. Use of excessive force can damage the router or SIP.

Installing a SIP

To install a SIP, follow these steps:

Step 1 Attach an ESD-preventive wrist or ankle strap and follow its instructions for use.

Step 2 Remove the blank filler plates from two slots and set them aside.

If you are replacing legacy line cards with a SIP, perform these tasks:

- a. Shutdown both slots in which you are installing the SIP using the **hw-module slot slot shutdown** command.
- b. Enter the **no card** command on both slots.
- c. Remove the legacy cards from the slots.
- d. Proceed to [Step 3](#).

Step 3 Grasp the faceplate of the SIP with one hand and place your other hand under the SIP (to support the weight of the SIP) and position the SIP in front of the appropriate line card slots.

**Caution**

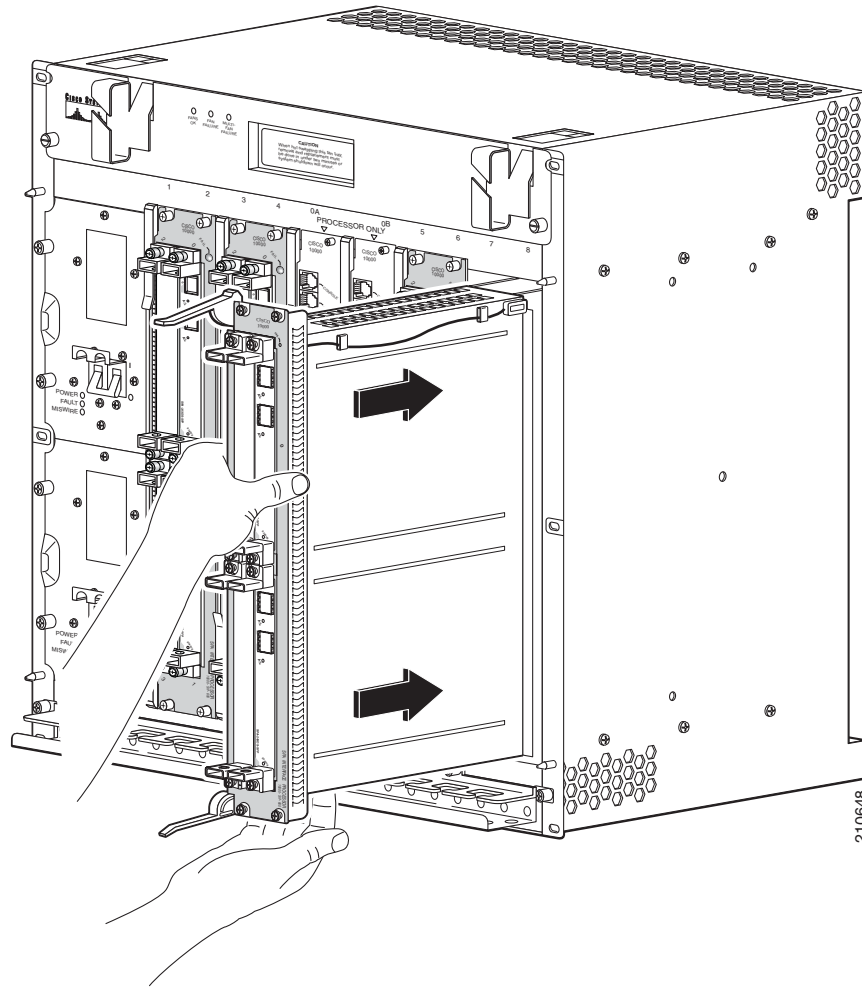
The Cisco 10000 SIP-600 weighs 10 lb (4.6 kg). Use two hands when handling the SIP.

Step 4 Carefully align the upper and lower card guides on the SIP with the upper and lower guides in the chassis and slide the SIP into the module slot until you can feel it begin to seat in the backplane connectors, as shown in [Figure 5-2](#).

**Note**

A SIP is not supported if the SIP is installed in even slots.

Step 5 Pivot the SIP ejector levers to the open position as shown in [Figure 5-2](#).

Figure 5-2 Inserting the SIP

- Step 6** Simultaneously pivot both SIP ejector levers toward each other (until they are parallel to the faceplate) to firmly seat the SIP in the router backplane. See [Figure 5-3](#).

- | | |
|----------------|---|
| Step 7 | Tighten the captive screws on each end of the SIP faceplate to ensure proper EMI shielding and to prevent the SIP from becoming partially dislodged from the backplane (see Figure 5-4 for the location of the captive screws). |
| Step 8 | Install the SPAs and optics modules in the SPAs that use them. See the “Installing a SPA in a SIP” section on page 6-4 . |
| Step 9 | Install the interface cables. |
| Step 10 | If you installed the SIP in slots that previously contained legacy line cards, enter the no hw-module slot slot shutdown command to activate the SIP. |

When performing the following procedures, wear a grounding wrist strap to avoid ESD damage to the SIP. Some platforms have an ESD connector for attaching the wrist strap. Do not directly touch the midplane or backplane with your hand or any metal tool, or you could shock yourself.

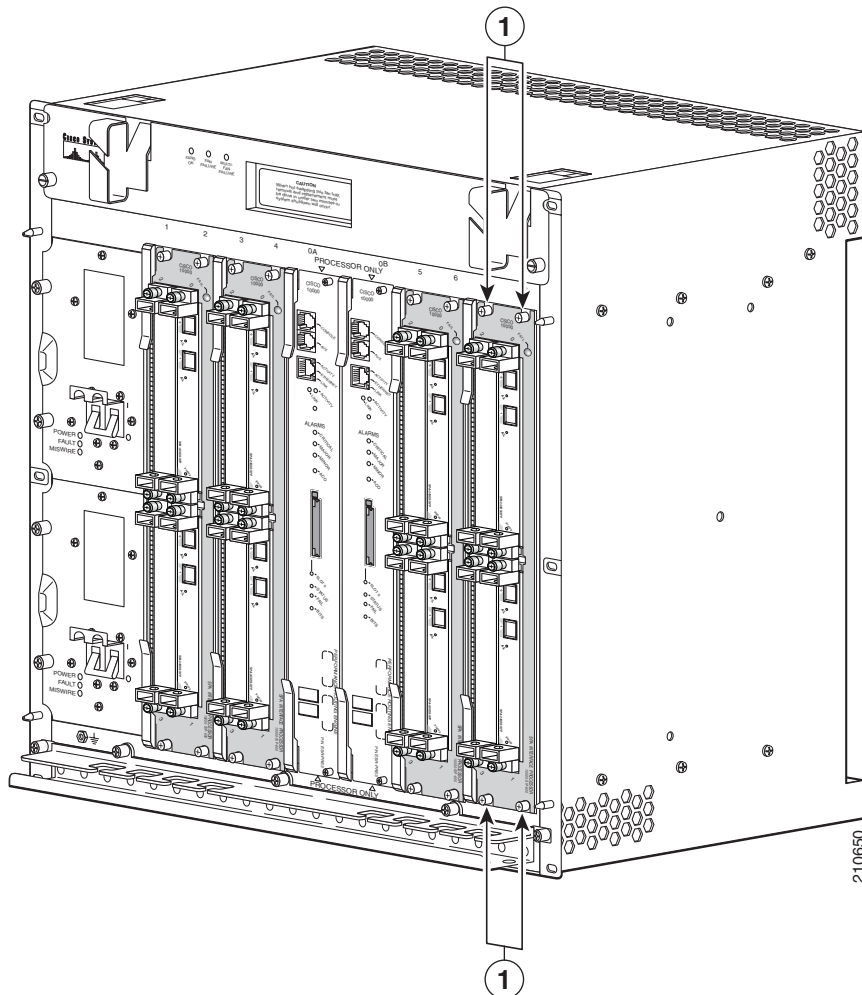
**Warning**

Because invisible radiation may be emitted from the aperture of the port when no fiber cable is connected, avoid exposure to radiation and do not stare into open apertures.

To remove a SIP, follow these steps:

- Step 1** Attach an ESD-preventive wrist or ankle strap and follow its instructions for use.
- Step 2** Identify the SIP to be removed and disconnect all interface cables from the ports. Be sure to note the current connections of the cables to the ports on the SPAs installed in the SIP.
- Step 3** Unscrew the captive screws on each end of the SIP faceplate (see [Figure 5-4](#)).

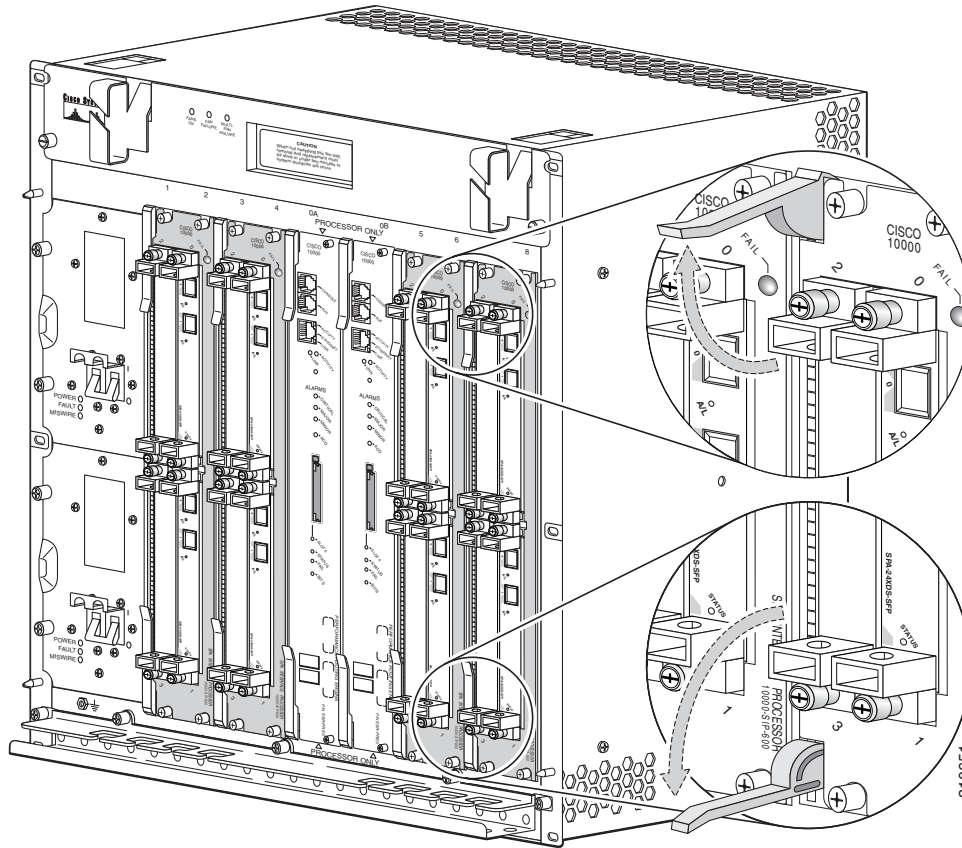
Figure 5-4 Captive Screws



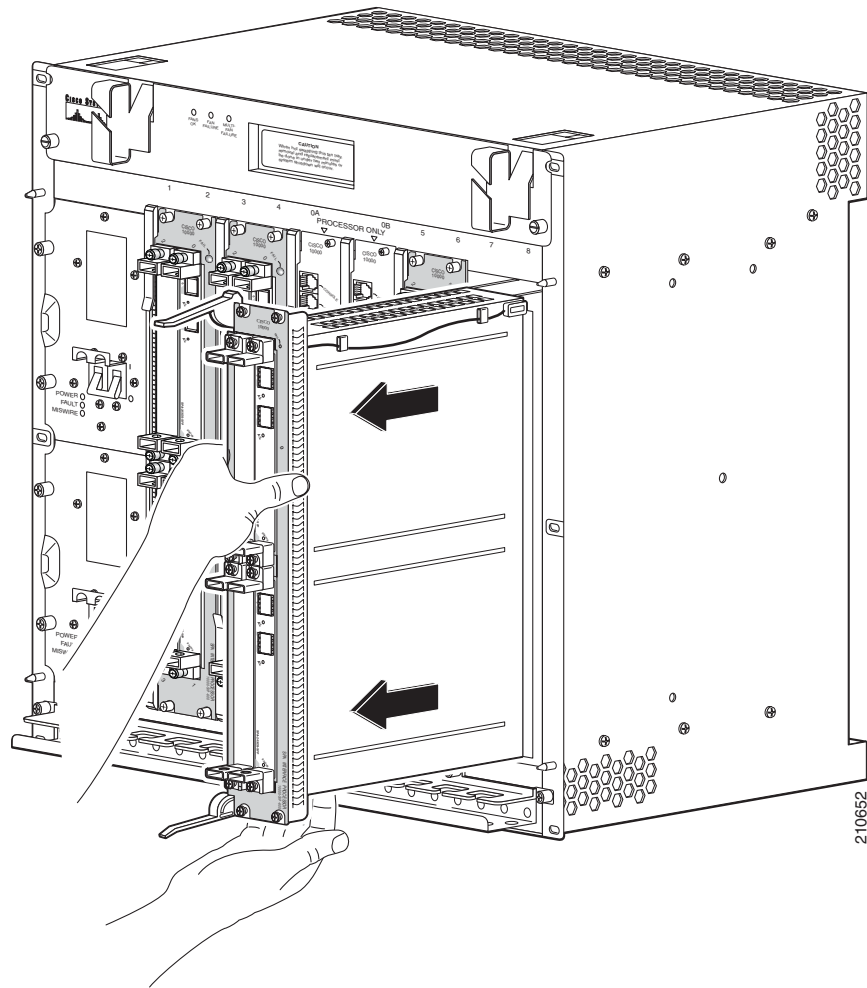
1	Captive screws
----------	----------------

- Step 4** Simultaneously pivot both SIP ejector levers away from each other to disengage the SIP from the backplane, as shown in Figure 5-5.

Figure 5-5 Opening the Ejector Levers



- Step 5** Touching only the metal card carrier, slide the SIP out of the slot (see Figure 5-6). Place the SIP on an antistatic surface, or in an antistatic bag.

Figure 5-6 Removing the SIP

- Step 6** If you are not installing a new or replacement SIP, install blank filler plates to cover the slots and tighten the screws on the blank filler plates.

**Warning**

Blank faceplates (filler panels) serve three important functions: they prevent exposure to hazardous voltages and currents inside the chassis; they contain electromagnetic interference (EMI) that might disrupt other equipment; and they direct the flow of cooling air through the chassis. Do not operate the system unless all cards and faceplates are in place. Statement 1029



CHAPTER 6

Installing and Removing a SPA

This chapter describes how to install or remove SPAs on the Cisco 10000 series router. This chapter contains the following sections:

- [Handling SPAs, page 6-1](#)
- [Online Insertion and Removal of a SPA, page 6-2](#)
- [Installing a SPA in a SIP, page 6-4](#)
- [Removing a SPA from a SIP, page 6-4](#)
- [Optical Device Maintenance, page 6-4](#)
- [Checking the Installation, page 6-5](#)
- [SPA Blank Filler Plates, page 6-6](#)

Handling SPAs

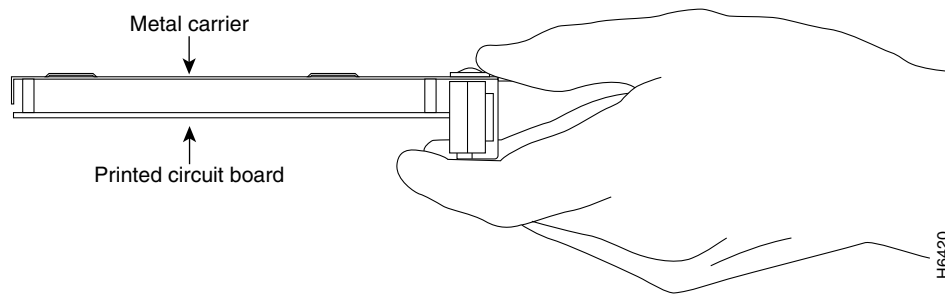
Each SPA circuit board is mounted to a metal carrier and is sensitive to electrostatic discharge (ESD) damage. Before you begin installation, read the “Preparing to Install a SIP or a Shared Port Adapter,” chapter for a list of parts and tools required for installation.



Caution

Always handle the SPA by the carrier edges and handle; never touch the SPA components or connector pins. (See [Figure 6-1](#)).

When a subslot is not in use, a SPA blank filler plate must fill the empty subslot to allow the router or switch to conform to electromagnetic interference (EMI) emissions requirements and to allow proper airflow across the installed modules. If you plan to install a SPA in a subslot that is not in use, you must first remove the SPA blank filler plate.

Figure 6-1 Handling a SPA

Online Insertion and Removal of a SPA

The Cisco 10000 series router supports OIR of a SPA independently of removing the SIP. This means that a SIP can remain installed in the router with one SPA remaining active, while you remove another SPA from one of the SIP subslots. If you are not planning to immediately replace a SPA into the SIP, then be sure to install a blank filler plate in the subslot. The SIP should always be fully installed with either functional SPAs or blank filler plates.

The interface configuration is retained (recalled) if a SIP or SPA is removed and then replaced with one of the same type.

If you are planning to remove a SIP along with its SPAs, then you do not need to follow the instructions in this section. To remove a SIP, see [Chapter 5, “Installing and Removing a SIP”](#).

Deactivating a SPA

Although graceful deactivation of a SPA is preferred using the **hw-module subslot shutdown** command, the Cisco 10000 series router does support removal of the SPA without deactivating it first. Before deactivating a SPA, ensure that the SIP is seated securely into the slot before pulling out the SPA itself.

If you are preparing for an OIR of a SPA, there are no standard interfaces to be shut down prior to deactivation of the SPA. The **hw-module subslot shutdown** command automatically stops traffic on the Gigabit Ethernet interfaces and deactivates them along with the SPA in preparation for OIR. In similar fashion, you do not need to independently restart any Gigabit Ethernet interfaces on a SPA after OIR of a SPA or SIP.



Note

You do not need to shut down a SPA if you are removing it and replacing it with the same exact model of SPA in an online insertion and removal (OIR) operation. However, you must shut down a SPA and preprovision the line card slot whenever you are replacing a SPA with a different model of SPA.

To deactivate a SPA and all of its interfaces prior to removal of the SPA, use the following command in global configuration mode:

Command	Purpose
Router(config)# hw-module subslot slot/subslot shutdown [powered unpowered]	Deactivates the SPA in the specified slot and subslot of the SIP, where: • <i>slot</i>—Specifies the chassis slot number where the SIP is installed. • <i>subslot</i>—Specifies the subslot number on a SIP where a SPA is installed. • powered—Shuts down the SPA and all of its interfaces, and leaves them in an administratively down state with power enabled. This is the default state. • unpowered—Shuts down the SPA and all of its interfaces, and leaves them in an administratively down state without power.
Router(config)# no card slot/subslot	(Optional) Preprovisions a line card slot in the Cisco 10000 series router to accept the specified SPA. • <i>slot</i>—Specifies the number of the line card slot to preprovision. • <i>subslot</i>—Specifies the number of the line card subslot to preprovision.

Reactivating a SPA

If you deactivate a SPA using the **hw-module subslot shutdown** global configuration command and again reactivate it without performing an OIR, you need to use the **no hw-module subslot shutdown** global configuration command to reactivate the SPA and its interfaces.

To activate a SPA and its interfaces after the SPA has been deactivated, use the following command in global configuration mode:

Command	Purpose
Router(config)# no hw-module subslot slot/subslot shutdown	Activates the SPA and its interfaces in the specified slot and subslot of the SIP, where: • <i>slot</i>—Specifies the chassis slot number where the SIP is installed. • <i>subslot</i>—Specifies the subslot number on a SIP where a SPA is installed.

Verifying the Status of a SPA

When you deactivate a SPA, the corresponding interfaces are also deactivated. This means that these interfaces will no longer appear in the output of the **show interface** command.

To verify the deactivation of a SPA, enter the **show hw-module subslot oir** command in privileged EXEC configuration mode. Observe the Operational Status field associated with the SPA that you want to verify.

In the following example, the SPA located in subslot 1 of the SIP in chassis slot 7 is administratively down after entering the **hw-module subslot shutdown powered** command:

```
Router(config)# hw-module subslot 7/1 shutdown powered
Performing request on SPA 7/1 in jacket card in slot 7
Router(config)# exit
Router# show hw-module subslot 7/1 oir
Module           Model              Operational Status
-----
subslot 7/1      SPA-5X1GE-V2       admin down
Router#
```

Installing a SPA in a SIP

To install a SPA in a SIP, do the following:

-
- Step 1** To insert the SPA in the SIP, locate the guide rails inside the SIP that hold the SPA in place. They are at the top right and bottom right of the SPA slot and are recessed about an inch.
 - Step 2** Carefully slide the SPA all the way in the SIP until the SPA is firmly seated in the SPA interface connector. When fully seated, the SPA might be slightly behind the SIP faceplate.
 - Step 3** After the SPA is properly seated, fasten the SPA in place with the captive installation screws.
-

Removing a SPA from a SIP

To remove a SPA from a SIP, do the following:

-
- Step 1** If attached, remove any cables from the SPA.
 - Step 2** To remove the SPA from the SIP, unfasten the captive installation screws on the SPA.
 - Step 3** Grasp the handles of the SPA and pull the SPA from the SIP. (You have already disconnected the cables from the SPA when removing the SIP).
-

Optical Device Maintenance

Any contamination of the fiber connection can cause failure of the component or failure of the whole system. A particle that partially or completely blocks the core generates strong back reflections, which can cause instability in the laser system. Inspection, cleaning, and reinspection are critical steps to take before making fiber-optic connections.

Cleaning Optical Devices

See *Inspection and Cleaning Procedures for Fiber-Optic Connections* for information on cleaning optical devices.

Checking the Installation

This section describes the procedures you can use to verify the SIP and SPA installation, and includes information on the following topics:

- [Verifying the Installation, page 6-5](#)
- [Using show Commands to Verify SPA Status, page 6-6](#)

Verifying the Installation

This section describes how to verify the SIP and SPA installation by observing the SIP LED states, SPA LED states, and the information displayed on the console terminal.

When the system has reinitialized all interfaces, the SIP FAIL LED is off and the SPA STATUS LEDs are green (on). The port LEDs (C/A and A/L) may be green (on), depending on your connections and configuration. The console screen also displays a message as the system discovers each interface during its reinitialization.

Use the following procedure to verify that a SIP and SPA are installed correctly:

- Step 1** Observe the console display messages and verify that the system discovers the SIP, while the system reinitializes each interface, as follows:
- As a SIP initializes, the FAIL LED is amber indicating that power is on and the SIP is being configured. The SIP is active when the FAIL LED turns off.
 - SPAs follow the same sequence once the SIP has completed its initialization. The SPA STATUS LEDs illuminate amber and then turn to green when the SPAs become active.
 - When the SIP FAIL LED is off and the SPA STATUS LEDs are green, all associated interfaces are configurable.
 - If a SIP or SPA is replaced with a module of the same type (as in an OIR or hardware swap), the previous configuration is reinstated when the SIP or SPA becomes active.
 - If a SIP or SPA has not been previously installed in the same slot or subslot, the configuration for all associated interfaces are empty.



Note New interfaces are not available until you configure them.

- Step 2** If the SIPs and SPAs have not become active within three minutes, refer to the system console messages as follows:
- If a SIP or SPA is undergoing a Field Programmable Device (FPD) upgrade, the console messages indicate that the FPD process has been initiated. The upgrade process can take several minutes. Use the **show upgrade fpd progress** command to obtain information about the FPD process. SIPs or SPAs that undergo an FPD upgrade automatically reboot. Return to [Step 1](#).

- If there is no indication that an FPD upgrade is under way, see [Chapter 7, “Troubleshooting the Installation.”](#)

Using show Commands to Verify SPA Status

[Table 6-1](#) describes some **show** commands to verify that SPAs are configured and operating correctly.

Table 6-1 *show Commands to Display SPA Information*

Command	Descriptions
<code>router(config)# show running-config</code>	Displays the router's running configuration and interfaces available in the system, including the SPA interfaces.
<code>router(config)# show hw-module subslot all oir</code>	Displays the operational status of all SPAs.
<code>router(config)# show diag</code>	Displays the SPA type in the specified slot and subslot, SPA operational state, number of ports, hardware revision, part number, transeiver state if initialized and EEPROM contents.
<code>router(config)# show hw-module subslot all fpd</code>	Displays the field-programmable devices (FPD) version information of SPAs.
<code>router(config)# show version</code>	Displays the Cisco IOS software version, names and sources of configuration files, and boot images.
<code>router(config)# show interfaces</code>	Displays SPA configuration and statistics information.

SPA Blank Filler Plates

SPA blank filler plates are available to fill an unused SPA subslot.

When a SPA subslot is not in use, a SPA blank filler plate must be installed in the empty subslot to allow the router or switch to conform to electromagnetic interference (EMI) emissions requirements and to allow proper airflow across the SPAs. If you plan to install a new SPA in a subslot that is not in use, you must first remove the SPA blank filler plate.



CHAPTER 7

Troubleshooting the Installation

This chapter describes how to troubleshoot the installation of SIPs and SPAs on the Cisco 10000 series router. This chapter contains the following sections:

- [Troubleshooting, page 7-1](#)
- [Using debug Commands, page 7-2](#)
- [Packing a SPA for Shipment, page 7-3](#)
- [Packing a SIP for Shipment, page 7-3](#)

Troubleshooting

This section describes troubleshooting the installation of the SIPs and SPAs. Possible problems, observations and comments, and solutions are indicated for the following troubleshooting symptoms:

- SIP transitions repeatedly from on to off
- SIP is deactivated
- SPA is down and the line protocol is down

SIP Transitions Repeatedly From On to Off

Possible Problem	Observations and Comments	Solutions
SIP is booting; this is normal operation	SIP FAIL LED is on	Wait 30 seconds until the boot process completes and the FAIL LED turns off.
SIP does not go beyond the bootup stage	SIP FAIL LED stays on	Follow the recommended action for the displayed error message.
SIP has experienced a failure	SIP FAIL LED remains on more than 5 seconds, or is on during normal operation	Follow the recommended action for the displayed error message.
SIP FPGA is not up to date The SIP FPGA update is not supported. Only SPA update is supported.	During SIP initialization, the need to update the FPGA is automatically detected	If the SIP is cycling because of an FPD problem, the most likely cause is a FPD failure or that the FPD package file is not present. For more information about performing FPD upgrades, refer to the “Upgrading Field-Programmable Devices” chapter in the <i>Cisco 10000 Series Router SIP and SPA Software Configuration Guide</i> .

SPA Is Deactivated

Possible Problem	Observations and Comments	Solutions
SPA is not fully seated in the SIP	Output of the show diag slot command SPA STATUS LED is off	Follow this procedure: - Remove the SPA from the SIP. - Inspect the SIP and the SPA. Verify there are no bent pins or parts and that there is nothing lodged in the two devices that could prevent a good connection. - Insert the SPA in the SIP by sliding the SPA all the way into the SIP until the SPA is firmly seated in the SPA interface connector. When fully seated in the SIP, the SPA might be slightly behind the SIP faceplate.
SPA is not supported on the SIP	Output of the show diag slot command SIP STATUS LED is off	Install a SPA supported on the SIP.
SPA is not at the minimum hardware revision level	Output of the show hw-module subslot fpd command Output of the show diag command SPA STATUS LED is off	Follow the FPD upgrade process to update the FPGA. For more information about performing FPD upgrades, refer to the “Upgrading Field-Programmable Devices” chapter in the <i>Cisco 10000 Series Router SIP and SPA Software Configuration Guide</i> .
SPA is misconfigured	Output of the show log command	Refer to the configuration section of the specific SPA software configuration guide, or use the Cisco IOS software configuration documentation listed in the “Obtaining Documentation, Obtaining Support, and Security Guidelines” section on page ix.

Using debug Commands

Along with the other **debug** commands supported on the Cisco 10000 series router, you can obtain specific debug information for the SIP on the Cisco 10000 series router using the **debug hw-module** privileged EXEC command. The **debug hw-module** command is intended for use by Cisco Systems technical support personnel.

**Caution**

Because debugging output is assigned high priority in the CPU process, it can render the system unusable. For this reason, use **debug** commands only to troubleshoot specific problems or during troubleshooting sessions with Cisco technical support personnel. Moreover, it is best to use **debug** commands during periods of lower network traffic and fewer users. Debugging during these periods decreases the likelihood that increased **debug** command processing overhead will affect system use.

For more information about other debug commands supported on the Cisco 10000 series router, refer to the Cisco IOS Command Reference publication for your Cisco IOS software release.

Packing a SPA for Shipment

This section provides step-by-step instructions for packing a SPA and the cable-management brackets for shipment. Before beginning this procedure, you should have the following original Cisco Systems packaging materials:

- Thermoform container (transparent plastic-molded clamshell)
- Carton

**Caution**

Use Cisco Systems original packaging for the shipment of all SPAs and cable-management brackets. Failure to properly use Cisco Systems packaging can result in damage or loss of product.

**Warning**

During this procedure, wear grounding wrist straps to avoid ESD damage to the card. Do not directly touch the backplane with your hand or any metal tool, or you could shock yourself.

**Note**

These instructions assume that the SPA and cable-management brackets have been removed from the router according to the recommended procedures specified in this guide.

To pack a SPA and the cable-management brackets for shipment, follow these steps:

- Step 1** Open the thermoform container and place the SPA and each of the cable-management brackets into the appropriate cavities.

**Caution**

Always handle the SPA by the carrier edges and handle; never touch the SPA components or connector pins.

- Step 2** Close the thermoform container. Be sure to lock the snaps securely.
- Step 3** Check that the thermoform container is fully closed. Apply tape or a label closure over the opening to ensure that the container stays closed during shipping.
- Step 4** Place the thermoform container into the carton.
- Step 5** Close the carton.
- Step 6** Apply tape over the carton flap to ensure that the carton stays closed during shipping.

Packing a SIP for Shipment

This section provides step-by-step instructions for packing a SIP for shipment. Before beginning this procedure, you should have the following original Cisco Systems packaging materials:

- Static shielding bag
- Smaller inner carton
- Larger exterior carton

- Two foam packing cushions

**Caution**

Use Cisco Systems original packaging for the shipment of all SIPs. Failure to properly use Cisco Systems packaging can result in damage or loss of product.

**Warning**

During this procedure, wear grounding wrist straps to avoid ESD damage to the card. Do not directly touch the backplane with your hand or any metal tool, or you could shock yourself.

**Note**

These instructions assume that the SIP has been removed from the router according to the recommended procedures specified in this guide.

To pack a SIP for shipment, follow these steps:

-
- Step 1** Insert the SIP into the static shielding bag.
 - Step 2** Insert the bagged SIP into the smaller inner carton. Be careful to position the SIP so that the faceplate is up against the cardboard cushions. Fold the small flaps first and then the big flaps.
 - Step 3** Close the smaller inner carton and tape the sides closed.
 - Step 4** Place the sealed smaller inner carton containing the SIP into the two foam packing cushions (they only fit one way).
 - Step 5** Place the sealed smaller inner carton and packing cushions into the larger exterior carton, and seal the larger exterior carton with tape for shipment.
-



G L O S S A R Y

B

blank filler plate An empty panel used to fill vacant subslots on a SIP. For proper operation, a SIP should be fully installed with either functional SPAs or blank filler plates.

F

FPD Field-programmable device. General term for any hardware component implemented on router cards that supports separate software upgrades. SIPs and SPAs must have the right FPD version to function properly; an FPD incompatibility will disable all interfaces on the SPA or all SPAs within the SIP.

FPD image package An FPD image package is used to upgrade FPD images. Whenever a Cisco IOS image is released that supports SPAs, a companion SPA FPD image package is also released for that Cisco IOS software release.

full-height, double-wide Describes the dimensions of a SPA that occupies four standard, half-height SIP subslots or two full-height SIP subslots.

O

OIR Online insertion and removal. Feature supported by SIPs and SPAs allowing removal of the cards while the router and the cards are activated, without affecting the operation of other cards or the router. Although this removal can be done while the SIP or SPA is activated, it is generally recommended that you gracefully deactivate the hardware using the appropriate commands for your platform prior to removal of the hardware.

S

SFP Small form-factor pluggable optical transceiver. A type of fiber optic receptacle device that mounts flush with the front panel to provide network connectivity.

single-height Describes the dimension of a SPA that occupies a single SIP subslot, or half of the SIP.

SIP SPA interface processor. A SIP is a platform-specific carrier card that inserts into a router slot like a line card. A SIP can hold one or more SPAs in its subslots, depending on the SIP type. The SPA provides the network interface. The SIP provides the connection between the route processor (RP) and the SPA.

SPA	Shared port adapter. A SPA is a modular, platform-independent port adapter that inserts into a subslot of a compatible SIP carrier card to provide network connectivity and increased interface port density. The SPA provides the interface between the network and the SIP.
subslot	Secondary slot on a SIP where a SPA is installed. The primary slot is the chassis slot on the router.



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